SCIENTIFIC AMERICAN

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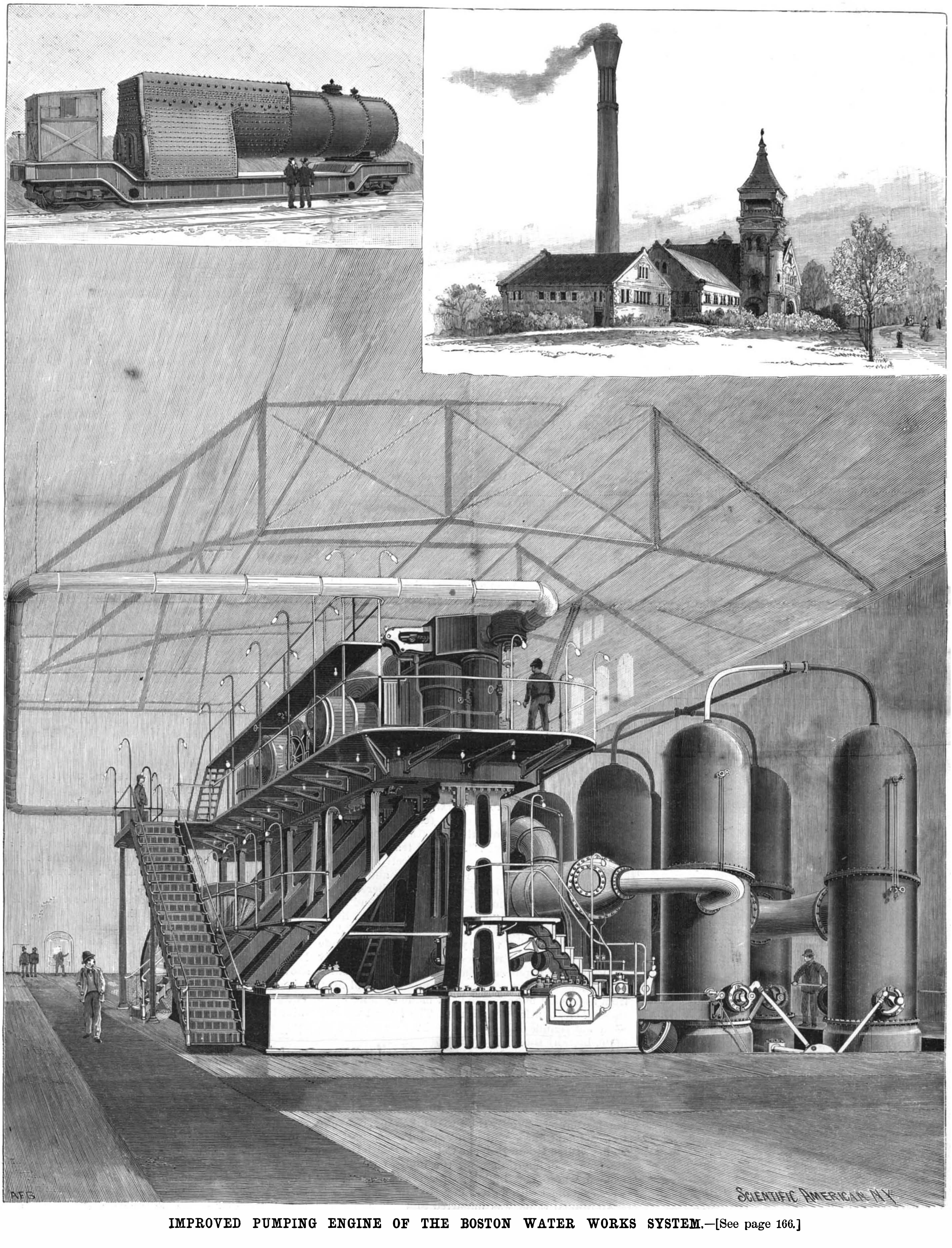

IMPROVED PUMPING ENGINE OF THE BOSTON WATER WORKS SYSTEM.—[See page 166.]

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NEW YORK, SATURDAY, SEPTEMBER 14, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1028.

For the Week Ending September 14, 1895.

Price 10 cents. For sale by all newsdealers.

THE PHYSICS OF THE BICYCLE.

Referring to our article on "The Physics of the Bicycle," contained in the SCIENTIFIC AMERICAN of August 3, 1895, the Boston Journal of Commerce has to say: "It is with extreme reluctance that 'our' expert bicyclist is compelled to dissent from the views of so able and accomplished an authority on physical science as the SCIENTIFIC AMERICAN, as to some of the conclusions arrived at in the above clipping. He has just returned from a three weeks' tour of duty, doing the convolutions of the White Mountains, and the expert practical knowledge of 'biking' which he has gathered in on this as well as several other occasions makes it evident to him that the writer is not much of an expert on the bicycle, or he would have noticed at the very first that there is a constant effort to keep the wheel in an upright position. In just the act of keeping the balance alone, to say nothing about steadying, the wheel has to be turned to the right whenever the rider finds himself falling in this direction, which gradually brings the wheel under the center of gravity, and turned to the left whenever it is found necessary to catch the balance in this direction. An expert has no trouble in jumping on the crank shaft of a single wheel and keeping his balance in all directions, with only one single point beneath him to rest upon, by simply increasing the speed of the wheel whenever he is tipping forward, and slacking up to regain any tendency to fall backward, guiding to either the right or left to keep in an upright position. To stand still on a bicycle the front wheel is turned to an angle of about 45° and pedaled forward and back just enough to preserve the center of gravity."

All this simply substantiates what is said in the article referred to. If the writer had gone a little deeper into the physics of the subject, his comment might have been different.

Why is a "constant effort" necessary to keep the bicycle up? It is because the "additional force" mentioned in our article, such as the movement of the rider, an obstruction, or the wind, acts upon the wheel to change its plane of motion, whereupon the rider must make some effort to maintain his balance, as stated by the "bicycle expert."

No one can take the first lesson in bicycle riding without having it thoroughly impressed on his mind that there "must be a constant effort to keep the wheel in an upright position." But this does not alter the "physical fact." It is still true that "a body in motion persists in maintaining its plane of motion unless some additional force acts on the body at an angle to the original line of motion." The additional forces referred to which tend to upset the bicycle are accidental and very frequent, requiring the almost continuous swinging of the guide wheel in one direction or the other, as stated by the "expert." An expert wheelman can keep upon a straight course without manipulating the guide wheel at all.

A bicycle with the guide wheel fixed, with a load immovably fastened to it, when set in motion on a smooth surface, will retain its upright position so long as its momentum lasts. A common wagon wheel set rolling with considerable speed will roll on alone in a vertical plane until it meets an obstruction or loses its momentum.

There is truth in the "bicycle expert's" remarks, but they do not in the least alter the physical fact as originally stated.

PROCEEDINGS OF THE AMERICAN ASSOCIATION AT SPRINGFIELD, MASS.

Besides furnishing facilities for seeing Forest Park, the Armory and other local attractions, the generosity of the local committee gave the scientific visitors an opportunity to see some of the educational institutions of Western Massachusetts. A special train took 300 of them to Amherst, where they first inspected the State agricultural college, its farm and garden, and particularly its insecticide experiment station, where war is waged on the gypsy moth, the elm beetle and other insect pests. Next the laboratory, observatory, library and cabinet of Amherst College were visited. The famous collection of twenty thousand tracks made ages ago by birds and reptiles was explained familiarly by Professors Hitchcock, Emerson and Cope. These impressions left on the red sandstone were of all sizes, from those that might have been made by mice up to those of elephantine magnitude. The largest were by what was significantly named the Brontozoum giganteum, literally the great thunder beast. The stale jest as to this being the headquarters of the American Track Society was capped by the new one that these tracks were made by a "four-toed toad." Smith College for young women was visited at Northampton, whose fine art gallery, cabinet, and botanical garden were much admired. Trolley rides were taken to Easthampton, Williamsburg, and other points. A party of eighty visited Mount Holyoke College at South Hadley, the pioneer of institutions for the higher education of women, whose new buildings for scientific purposes were examined with a great degree of interest.

Additional value was imparted to these and other neighboring excursions by two evening lectures with lantern illustrations. The first of these was by Prof. W. M. Davis, of Harvard, on the "Geology of the Connecticut Valley." His style is a model of clearness, and he gave to even those of his hearers who were familiar with the main facts a more vivid apprehension of them. The lowlands and highlands, the valleys and mountains, the ridges and sheets of sandstone, the scattered bowlders and beds of gravel were all made tributary to practical lessons concerning not only geology but also geography, agriculture and the progress of civilization. The other lecture was by Dr. Cornelius Van Brunt, of New York, concerning the "Wild Flowers of the Connecticut Valley." He showed rapidly and with running explanations 140 lantern slides which were all taken from nature by himself and painted by Mrs. Van Brunt, and which are certainly some of the most brilliant and beautiful slides ever shown on the screen. He admitted, however, that most of his specimens were from the Hudson River Valley, though none were exhibited that could not be also found in the valley of the Connecticut.

In connection with these illustrated lectures which were given in the City Hall, and were complimentary to the citizens of Springfield, mention may here be made of the day given by the section of physics to the subject of color photography. This was in what is known as Evangelist Hall, a much smaller room, and the hearers were mainly members of the association. The main paper on this fascinating art was by Mr. F. E. Ives, of Philadelphia, whose experiments have been frequently described. Three different methods are now attracting attention. The Lippman, or direct process, is based on the theory that if the light which forms the image passes through the sensitive film to a mirror in contact with it, the reflected rays produce the desired phenomena within the film. In practice a structureless film of bromide of silver in gelatine is used backed by mercury. But out of thousands of exposures few are successful. Hence the public expect better results from the composite methods of Joly or Ives. These rely on the fact that all colors can be reproduced to the eye by mixtures of three spectrum colors—red, green and blue violet. Three negatives are made by exposures through selected color screens adjusted to yield a record of the colors of the object, and a positive made from this set of negatives can at any time be translated in color by lantern projection, or in the photochromoscope. Three images are superimposed on the screen, and the three primary colors are found to be mixed in such proportions as to reproduce every color and gradation of light and shade. In practice the complete color record is now made on a single sensitive plate, at one exposure. Permanent color prints can also be made from the negatives on paper, though by a complicated and costly process detracting from its practical value. Joly, in place of three separate color screens, uses one particolored screen made up of narrow strips of red, blue and green, getting the same result as the Ives process, only by a short cut. Serious practical difficulties are met, and it is liable to yield in the lantern the effect of a colored picture on ribbed paper. All these matters were explained in detail by Mr. Ives, who ended by delighting his audience by the exhibition on the screen of his own admirable and surprisingly beautiful photographic reproduction in natural colors of objects varying in size from a box of candies, or a bouquet, up to the magnificent scenery of the Yellowstone Park. The rich azure of the pools, the fine browns of the ledges, the vivid green of the foliage, and all other tints and shades were brought out with a truthfulness and loveliness surpassing the skill of the painter.

In this same section remarkable facts were given by Professor Van Nardoff, of Barnard College, proving beyond question that red, green and blue are the primary colors, instead of red, blue and yellow, as has long been stated. His delicate apparatus formed white light from the former three as primaries, and also brought out various tints, by ingenious combinations whose mechanical details were devised by Mr. F. W. Huntingdon, of Montclair, N. J.

One of the most interesting papers was on voice production, and another on voice analysis, by Dr. Muckey and Dr. Hallock. These were illustrated, showing the vocal cords in action. The total range of sounds made by human voices is about six octaves. The greatest range of any single voice known was attained by Lucrezia Ajugari, in 1770, who actually sang from G2, with only 192 vibrations per second, up to C6, with 2,048 vibrations—a range of four and a half octaves. Ellen Beach Yaw has lately reached the same upper limit, but it is done by adding a child's register to that of a woman.

Voice analysis is recorded by making a resonator for the fundamental and overtones so as to sound in sympathy, and to cause tiny gas jets to flicker. These variations have hitherto been drawn by hand, but now they are photographed by a swiftly moving camera, so as to make a perfectly accurate record. Practically this invention is very useful in analyzing the voices of singers or speakers, and determining at once where they need improvement.

The address by Vice-President W. LeConte Stevens,

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before this section, on "Recent Progress in Optics," showed how rapidly the army of workers in that direction had increased and what wonders they were accomplishing. Any notice of such an exhaustive paper must necessarily be incomplete. The physicist is nearly powerless without the aid of a high order of mechanical skill. This is exemplified by what Brashear has done to help Michelson to measure the waves of light with accuracy so great that no error equal to one-twentieth of a wave length should appear on the reflecting surfaces. This entire work has been distinctly American. Fluorescent solutions enable us to bring within the domain of optics many wave lengths previously invisible. It is proved that the shining of luminous paint is accompanied with chemical action, and renders probable what may be termed chemiluminescence. The fact that substances which show no light at ordinary temperatures become luminous when warmed warrants the special term thermo-luminescence. On the other hand, many substances grow luminous at the temperature of liquid air (—180° C.) that ordinarily seem incapable of it; e. g., ivory, gelatine and pure water. All luminescence is probably jointly physical and chemical. The problem of securing on the photographic plate a lasting image of the varied tints of the spectrum has at last been fully solved, from a scientific standpoint, even if commercial demands are yet made in vain. This naturally led Prof. Stevens to a review of the experiments by Lippman, Joly and Ives concerning color photography. He also rapidly reviewed the recent applications of the spectroscope, and recent researches in the domain of polarized light. He spoke of progress in physiological optics.

Dr. William McMurtrie's address before Section C was on "The Relation of the Industries to the Advancement of Chemical Science." This was finely illustrated by the history of the development of the coal tar color industry, and other examples of the interplay between the new elements, new compounds, new laws and new methods that are constantly following each other so rapidly that few of us can keep ourselves informed concerning them. The study of the ultimate history of all industries will show that, as they grow, they make increasing demands upon educated men. For this reason the demand is growing for a combination of chemical and engineering knowledge in the same person.

This remark naturally leads us to a word about Prof. William Kent's address on the "Relation of Engineering to Economics." The true definition of engineering is that it is "the art of directing the great sources of power in nature for the use and convenience of man." Political economy is the science of wealth; but engineering is its producer by utilizing the forces of wind, running water, fuel as found in forests, coal mines, natural gas and oil wells. Mr. Kent dwelt particularly on the results accomplished by the use of coal as a vast source of reserved power and energy. After many quotations from the standard authorities, and examples furnished by the existing state of things, he concluded that engineering will contribute more largely than any other cause to merge capital and labor, by making the laborers themselves the capitalists. This will be the crowning triumph of engineering, and will warrant the political economists in burning all their old books and building a superb monument to James Watt, the engineer, who did more than all others to increase the wealth of the nations.

One of the most ancient things men have ever made is the arrow, and, perhaps, no living man has ever made this weapon the subject of such careful and successful study as Frank H. Cushing, the vice-president of the anthropological section. He skillfully traced it back to its simplest beginning, and told its fascinating history down to the present day. He told his own boyish experience in trying to manufacture stone arrows like those of the Indians, his tool being a tooth brush handle tied to a rod with a shoestring. He claims that this success proved that the primitive man first tried to shape an arrow from bone, then found, as he himself did, that the bone would chip away flakes from the flint, and thus discovered that most ancient of all the arts. He also expressed the conviction that the primitive men, judging by his own long residence amid the archaic Zunis, and other aboriginal tribes, must have had many simple, yet ingenious methods of work. They sought the materials amid beds of pebbles or buried ledges, blocking out the blanks for easy transportation as broad, leaf-shaped blades which were hidden in the soil. These caches are found to-day on old Indian ranges. They learned to work rapidly. He testified that in thirty-eight minutes he had actually made seven finished quartz arrow tips. Certain ceremonies were performed after the arrowmakers had done their work, which were described. The shafts were cut with due sacrifices, peeled and seasoned with reference to the uses to which they were to be put, for war or the chase. The feathering was from the wings of eagles or hawks, split, trimmed, and tufted according to special ideas of their own. Mr. Cushing gave details of the methods of the Pueblos, the Peruvians and others, in making not only arrows, but knives, spear heads, harpoons and all the various flint tools and implements. In his opinion, many of these articles were used indifferently for sundry purposes, just as a boy now uses his jack knife in many ways.

The arrow was reverenced by primitive man. The best archer became the born leader. The chosen arrow was the chieftain's sign. A bundle of these weapons was the most costly offering to the gods. Thus it won its place, not only in war and the chase, but in worship and ceremony. So it was amid the Romans, the Babylonians and the Chinese, as well as amid the early races of this country. Incidents were told showing its use in prayer, sacrifice and divination, and its relation to records, writings, gambling, and astrology. Thus what was at first but a flint taken from the ground became a symbol and a message for revealing the most secret thoughts of the human soul and a plumed stylus shaping the history of mankind.

Before the same section Miss Alice C. Fletcher read a paper on "Indian Songs and Music," giving the results of long study among the native tribes of our country. She reminded her hearers that every Indian ceremony had its appropriate music, and that among the aborigines, as well as among civilized nations, the songs of any people express their emotional life. Instead of being always improvised, as is commonly supposed, many Indian songs have been handed down from former generations. Yet a good new song rapidly wins popularity, and travels from tribe to tribe. The difficulties were related that had attended her efforts to collect Indian songs. Sacred songs and love songs were the most hard to gather. Persons may live a long while among the Indians and never hear them. In recording their songs the graphophone has been helpful, where it was available. The rhythm is always marked, usually with motions of the body. But there is also a material sense shown by singing in unison. Miss Fletcher has studied hundreds of Indian songs and those of widely scattered tribes, comparing them with the folk song of other races, with the result that they are universally built along the tones of a chord. Even when they sound like wild shouting this is found to be the case. The harmonic sense guides the voice when set going by the rhythmic impulse. In each song occurs a short melodic phrase, and these phrases are correlated into clauses.

Professor F. W. Putnam, whose long continued labors in archæology entitle him to speak with authority, described symbolic carvings on the ancient mounds of Ohio. His conviction is that the mound builders were a branch of the great southwest people who were represented by the ancient Mexicans, who reared the cities of Yucatan, and that these symbols closely resemble carvings found in Central America. Dr. Haliburton followed with remarks on the year of the Pleiades in prehistoric star lore; claiming that all over the world are vestiges of a calendar regulated by that group. He cited the Greeks, Romans, Pueblos, Polynesians, Blackfeet Indians, etc., and was fully confirmed in his remarkable statements by Professor Peet, Mr. Cushing, and other members present.

Professor G. F. Wright brought what he claimed to be an additional relic of prehistoric man in America, in the shape of a rough bit of stone from the glacial gravel near Steubenville, Ohio, which excited considerable discussion. By some it was regarded as a true glacial implement, while others doubted. The general feeling seemed to favor his claim.

At a joint meeting of several sections, Professor W. L. Moore, the chief of the weather bureau, spoke on its relations to the science and industry of the country. As a single instance he cited the fact that $36,000,000 had been saved to our shipping by the prediction of one great Atlantic storm last year. He marked out the new fields of inquiry that the bureau ought to enter, especially amid the upper strata of the air, and the study of the soil as well as the air in forecasting frosts. He traced the development of the weather bureau from the time when it only gave out "probabilities" down to the present accurate forecasting by States.

The nine sections met in different buildings, some of them far apart, and it was out of the question to keep track of all the papers one wanted to hear. Many of those not now mentioned were no doubt of equal value with those reported. It was worthy of note that many of the sections gave prominence to educational features of their special work. Giving a summary of the work done: there were 42 papers read in the section of Chemistry; 34 in that of Physics; 33 in that of Anthropology; 28 in that of Botany; 19 in that of Geology and Geography; 16 each in the sections of Astronomy and of Zoology; 13 in that of Economics and Statistics—or, as it is henceforth to be styled, "Social and Economic Science," and 6 in that of Mechanical Science and Engineering. This makes a grand total of 207 papers actually read in the nine sections, not counting the large number read in the affiliated societies meeting before and after the parent organization. Besides these there were three public addresses by Professor Davis, Dr. Van Brunt and Professor Bickmore, each illustrated, one presidential and seven vice-presidential addresses. On Sunday, though there were no business meetings, most of the pulpits of Springfield were occupied by clerical members of the A. A. A. S., among whom may be mentioned Professor G. F. Wright, of Oberlin; Professor W. N. Rice, of Wesleyan University; President Woodrow, of South Carolina; Dr. H. C. Hovey, of Newbury-port. Religious addresses were also made by Major Jed Hotchkiss, of Staunton, Va.; Miss Alice C. Fletcher, of Cambridge, and several others.

There were in attendance 367 members and fellows, hailing from thirty States and from Canada. The ranks have been thinned this year by the death of 42 members and fellows, and increased by the election of 185 new members; while 58 old members have been promoted to be fellows, and two persons were made honorary fellows.

An important step was taken in instructing the president and permanent secretary to arrange with the University of Cincinnati for safely storing the vast mass of volumes and scientific papers that have accumulated at the Salem office.

Buffalo was chosen as the next place of meeting, where the association has been in the habit of meeting every ten years. It was decided to meet in the fourth week of August, 1896, and to begin on Monday instead of on Thursday, although this change was not made without considerable opposition.

The following officers were chosen for the ensuing year, viz.:

President—Edward D. Cope, of Philadelphia.

Vice-Presidents—A. Mathematics and Astronomy, William E. Story, of Worcester, Mass.; B. Physics, Carl Leo Mees, of Terre Haute, Ind.; C. Chemistry, W. A. Noyes, of Terre Haute, Ind.; D. Mechanical Science and Engineering, Frank O. Marvin, of Lawrence, Kan.; E. Geology and Geography, Benjamin K. Emerson, of Amherst, Mass.; F. Zoology, Theodore N. Gill, of Washington, D. C.; G. Botany, N. L. Britton, of New York City; H. Anthropology, Alice C. Fletcher, of Washington, D. C.; I. Social Science, William R. Lazenby, of Columbus, O.

Permanent Secretary—F. W. Putnam, Cambridge, Mass.

The Moon's Power over the Weather.

Fallacies about the moon are numerous, such as that the full moon clears away the clouds; that you should only sow beans or cut down trees in the wane of the moon; that it is a bad sign if she changes on a Saturday or Sunday; that two full moons in a month will cause a flood; that to see the old moon in the arms of the new brings on rain, and many others, of which a catalogue alone would take up a good deal of space. M. Flammarion says that "the moon's influence on the weather is negligible. The heat reaching us from the moon would only affect our temperature by twelve millionths of a degree; and the atmospheric tides caused by the moon would only affect the barometric pressure a few hundredths of an inch—a quantity far less than the changes which are always taking place from other causes." On the whole we are disposed to agree with the rhyme which thus sums up the subject:

The moon and the weather
May change together;
But change of the moon
Does not change the weather.

Even the halo round the moon has been discredited, for Mr. Lowe found that it was as often followed by fine weather as by rain, and Messrs. Marriott and Abercromby found that the lunar halo immediately preceded rain in thirty-four cases out of sixty-one. We always have a lingering hope that some future meteorologist will disentangle the overlapping influences, and arrive some day at a definite proof that our satellite after all has something to do with our weather.—Nature.

How to Succeed as a Chemist.

"I noticed," said the druggist to his assistant, "that a gentleman came in with a prescription, and that you took it and gave him the stuff in about three minutes. What do you mean by that?" "It was only a little carbolic acid and water," replied the assistant. "I simply had to pour a few drachms of acid into the bottle and fill it up with water." "Never mind if you had only to do that," the druggist declared. "Don't you know that every prescription must take at least half an hour to fill or the customer will think he isn't getting anything for his money? When a prescription for salt and water, or peppermint and cough sirup is handed to you, you must look at it doubtfully, as if it were very hard to make up. Then you must bring it to me, and we will both read it and shake our heads. After that you go back to the client and ask him if he wants it to-day. When he says he does, you answer that you'll make a special effort. Now a patient appreciates a prescription like that he's had so much trouble over, and when he takes it he derives some benefit from it. But don't you do any more of that three-minute prescription business, my boy, if you want to become a first-class druggist."—Sheffield Telegraph.

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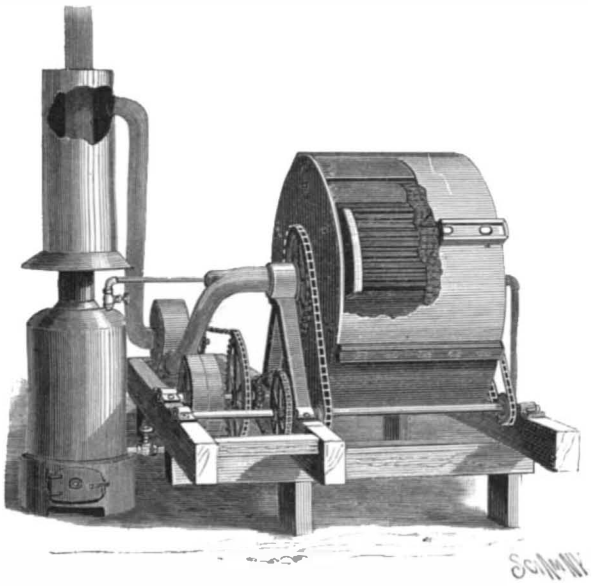
AN EFFICIENT COFFEE DRIER.

The illustration represents a steam and hot air heated drier so constructed that all the contents of the drying chambers must be thoroughly and similarly heated, the hot air being centrally introduced to the cylinder of the drier and necessarily escaping through the material being dried. A patent has been granted for the improvement to Emilio Cabrero y Echeandia, Las Marias, Porto Rico (address in care of C. A. Delgado,

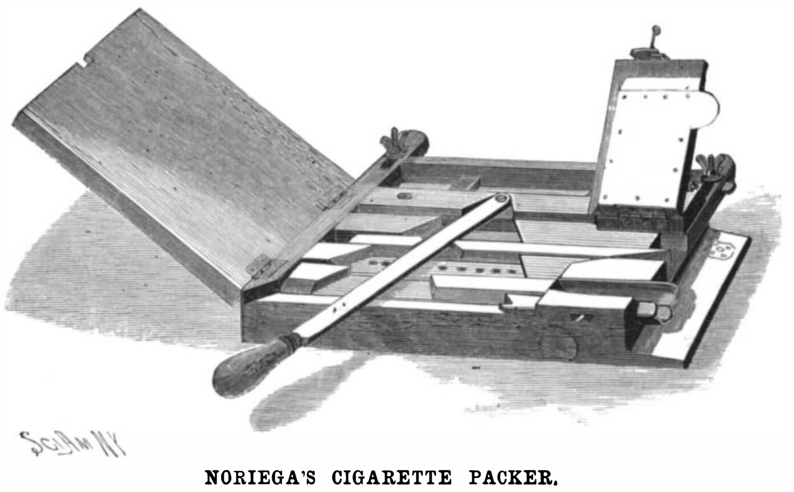


ECHEANDIA'S COFFEE DRIER.

76 Broad Street, New York). The drier cylinder has closed ends and axial sleeves rotating on an air pipe, the sleeves having sprocket wheels driven by chains from a drive shaft. The material to be dried is received in circumferential compartments, formed between perforated walls, the inner one of which is made of wire gauze and supported on cross pieces secured to the end plates, while the outer wall, preferably perforated only on horizontal strips, is similarly supported on cross pieces, which divide the space between the inner and outer walls into compartments, to cause the grain to be held more evenly in the revolving cylinder. There are also holes or openings in the cross pieces to facilitate the circulation of heat, and the compartments are filled and emptied through circumferential holes over which moves a slide plate. Through the axial sleeves passes a central perforated air pipe connected with a hot air supply by a pipe in which is a blower, to drive the hot air received from a furnace funnel into the drier. Supported on the air pipe in the upper half of the cylinder is also a framework with hollow heads carrying a cluster of steam pipes, connected at one end with a steam supply and at the other end with an exhaust pipe leading back to the boiler. The cylinder is thus heated by the hot air forced into it through the central pipe and also by direct radiation from the steam pipes, quickly and evenly drying the coffee, grain, or other material held in the compartments, as the revolutions of the cylinder tumble about the contents of the several compartments, and bring them all equally under the influence of the heat.

A MACHINE FOR PACKING CIGARETTES.

A machine of simple construction to facilitate the packing of cigarettes, and readily adjustable for packing different numbers, is shown in the accompanying illustration, and forms the subject of a patent issued



NORIEGA'S CIGARETTE PACKER.

to Mr. Eloy Noriega, of Apartado 516, city of Mexico, Mexico. A suitable base is recessed to form a box to which is hinged a lid, shown raised in the engraving, and at the front side of the box is a slideway for a plunger, the rear side of the slideway being formed by an adjustable cross bar, the plunger and the cross bar being recessed on their upper faces to permit the movement over them of a lever pivoted to the rear of the box. At the right of the plunger is a cigarette receptacle whose rear wall is formed by block drawn rearward by a spring and pressed forward by a wedge operated by the movement of the lever, the wedge sliding between the front cross bar and another adjustable cross bar. The rear cross bar has rearwardly extending arms connected by a cross bar moving in extensions from the casing, and the latter cross bar is adjusted to the desired position by means of screws and wing nuts.

The cross bar next the plunger has a series of apertures registering with apertures in the bottom of the casing at different distances from its front, screws being placed in different apertures as the bar is moved backward, while numerals adjacent to the apertures indicate how many cigarettes the receptacle will take when the fastening screws are inserted in the different apertures. Plungers of different widths are used for each position of the bar. The cigarette receptacle has outer projections over which a paper bag may be placed, and has a separate lid opened by a spring, the catch of the lid being released and the lid opening automatically, after the lever has been moved its full stroke to actuate the plunger and push the cigarettes out of the receptacle into the bag or wrapper inclosing the package. The cigarettes are inserted by hand before the lid is closed and the bag or wrapper placed in position.

The War Telephone.

An interesting experiment of installing a telephone by trotting cavalry was recently successfully undertaken by some Prussian Uhlans between Berlin and Potsdam. Two sets, of one officer and two non-commissioned officers, proceeded in the early morning respectively from Berlin and Potsdam. Each set was equipped with a complete telephone apparatus, which one of the men carried in a leather case on his chest, besides the requisite quantity of thin wire. The end of the wire was connected with the respective towns' telephone station and the wire was, by means of a fork fixed at the end of the lance, thrown over the tops of the trees along the road. As each kilometer of wire was thus suspended a halt was made, and it was ascertained whether there was connection with the station. A new kilometer of wire was then connected with the former, and on went the men. The two sets met at Teltow. The wires, having been respectively tested with their respective stations, were connected, and telephonic connection between Berlin and Potsdam was established. The distance is about twenty miles, and the whole thing was done in about four hours.

Tellurium.

Tellurium is found in small quantities all over the United States, commonly combined with gold, silver, and bismuth. When present in ores of silver and gold, it renders their reduction by the process of amalgamation impracticable, so that smelting has to be resorted to. Copper bullion sometimes contains tellurium. Even when amounting to only 1-400 of 1 per cent, it renders the copper so brittle as to be unfit for the finer uses, though it is good enough for castings. The business of freeing copper from the objectionable metal is conducted on a big scale, the largest works being located at Baltimore and at Bridgeport, Conn. From the copper in solution is precipitated a slime, consisting of gold, silver, arsenic, selenium and tellurium. The tellurium may be separated out by chemical means, but ordinarily it goes with the rest of the precipitate after the gold and silver have been saved.

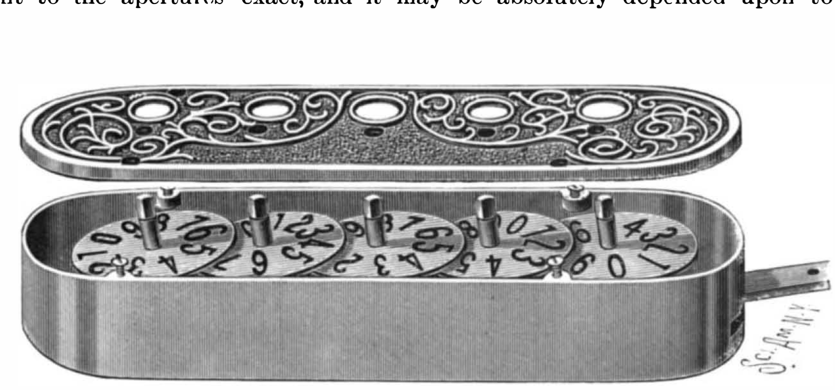
Tellurium forms a remarkable alloy with aluminum. When the two are melted together in certain proportions, they suddenly combine with a loud explosion, forming a very brittle substance. This substance, when dropped into water, gives forth a peculiar and abominable odor. The same odor is communicated to the breath of anybody who swallows a small quantity of the alloy. The smell, in fact, is one of the worst producible in the laboratory, surpassing even sulphureted hydrogen. Recently many experts in the science of chemistry have been trying to break it up, being convinced that it is in reality not an element but a compound of several elements unknown.

It is found in the Cripple Creek district, Colorado, and in Shasta County, California. One of the Cripple Creek camps is named Telluride.

A peculiarity of tellurium is that a bit of it as big as a pin's head mixed with a pound of gold will make the latter as brittle as glass. Gold ordinarily is extremely tough, being so ductile that 900 square inches of ordinary commercial leaf are beaten out from a single dollar's worth. One of the most striking characteristics of tellurium is its extreme brittleness, as noted both as regards copper and gold. It looks somewhat like silver and is very crystalline. It is slightly less heavy than iron.—Min. and Sci. Press.

THE "BRISTOL" COUNTER.

The illustration represents a simple, efficient and low priced counter, manufactured by C. J. Root, of Bristol, Conn. Its movements are positive, noiseless, exact, and it may be absolutely depended upon to



THE "BRISTOL" COUNTER.

keep a perfect register of every piece or article delivered from any machine to which it is attached. Our engraving shows the cover removed from the case of the counter, and it will be seen that the several numbered counting disks overlap each other, which brings the figures close up to the openings in the cover and facilitates reading them, all the figures being at equal distances from the openings. A spring-pressed catch engaging teeth on the disk-carrying shafts prevents their rotation except at the proper time. The whole device is very compact and the wearing surfaces are arranged to reduce the friction to a minimum. The dials are white, have ⅝ inch figures plainly marked in black enamel, and by the use of a key they may be instantly set at zero or at any desired starting point. The counter is made in three sizes, counting, respectively, 10,000, 100,000, 1,000,000.

FERNANDEZ'S MARINE AND LAND BICYCLE.

The illustration represents a bicycle construction designed to travel with equal facility on land and ice, and in the water. The improvement has been patented by Evaristo Fernandez, of No. 1819 Dumain Street, New Orleans, La. The wheels are preferably of copper, their side plates inclosing a large central air space, as shown in the sectional view. The rear wheel, forming the drive wheel, has on its sides lateral blades to engage the water when the bicycle is so used, and its felly is toothed to enable it to take hold of ice when the rubber tire, which is only designed for land use, is removed. To hold the bicycle upright when used in the water, side weights are connected by suitable bails to the wheel axles, but when the machine is used on land these weights are raised by chains which pass through a tube depending from the frame bars, links of the chain engaging a stop or pin to hold the weights raised. The saddle of the machine is of a form de-

A MARINE AND LAND BICYCLE.

signed to prevent the water from splashing up against the rider, and has at its rear end a lateral mud and water guard.

AUSTRALIAN TIN.—The stanniferous or tin-bearing area in New South Wales is estimated at 5,500,000 acres or 8,500 square miles. Up to the present, most of the tin has been obtained from the New England district. The value of the tin and tin ore raised in the colony and exported, from the beginning of 1872 to the end of 1894, was $51,287,250.

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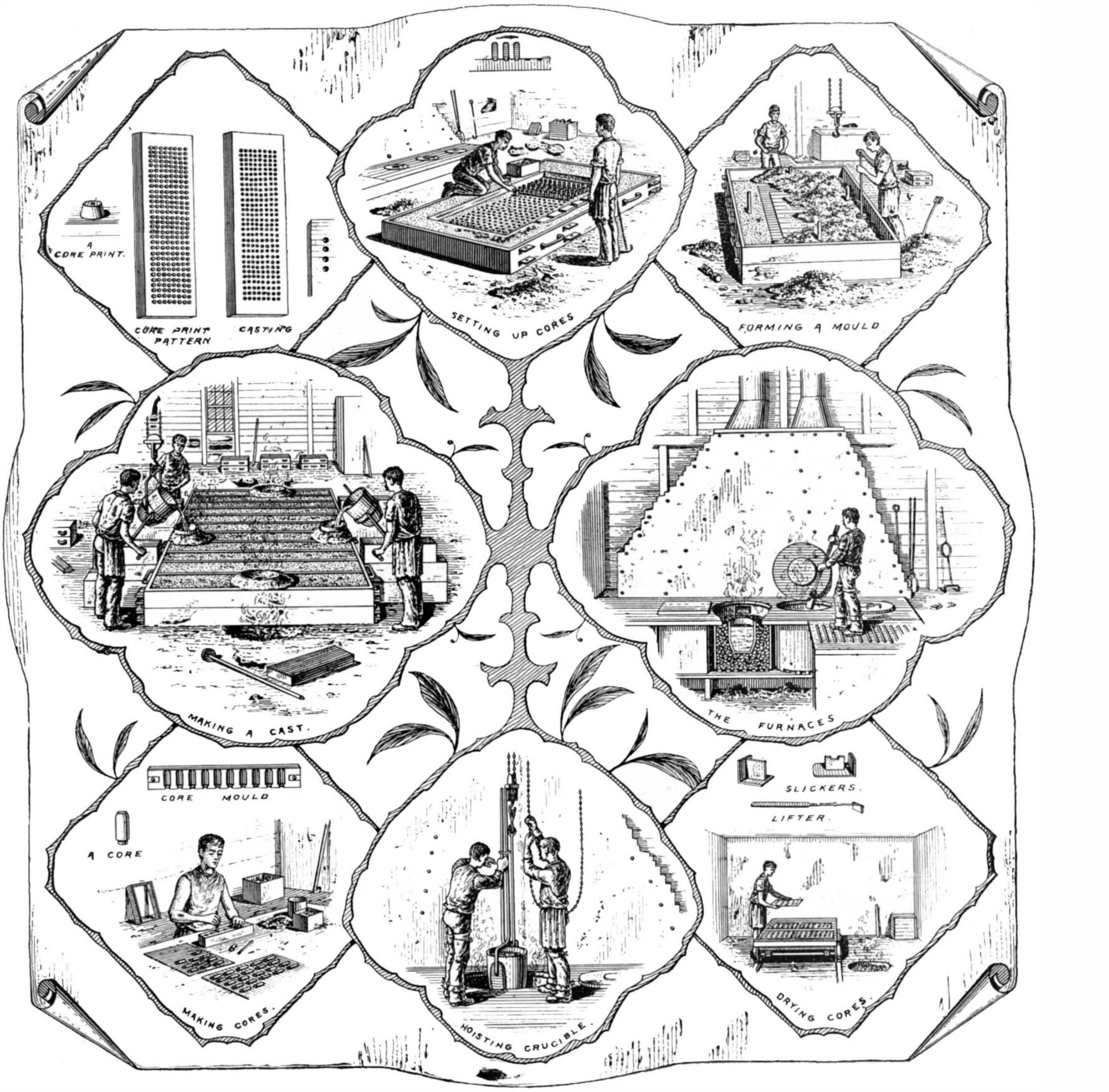
BRASS CASTING.

The illustrations accompanying this subject represent a casting in brass of a condenser tube head weighing about 500 pounds, the casting being 6 feet 3 inches in length, about 22 inches in width and about 2 inches in height or thickness. Moulded into this head are about 1,000 circular holes ¾ of an inch in diameter, in which the ends of the steam tubes or pipes are fastened. In forming a mould for a brass casting, a stronger sand than is used for iron is required, the molten metal traveling more, and, unless the proper sand is used, will eat itself into the mould. The best sand used for this purpose is called by moulders Jersey yellow sand No. 3. The tube holes are formed by means of bottle-neck cores 2 inches in length and ¾ of an inch in diameter, made of a composition of sand, wheat flour and stale beer, the outside being rubbed with plumbago to prevent the metal from sticking. Brass founders' furnaces are mostly sunk under the floor level, the pit for removing the ash being covered over with hinged iron gratings. The covers for the furnace tops are circular in shape and are constructed of cast iron. The internal building of the furnace is fire brick grouted with fire clay. The outside shell is circular and made of iron 4 feet in height and about 2 feet in diameter.

The crucibles in which the ingots of brass are melted are composed of fire clay and black lead and are known as blue pots. The crucibles principally used for medium large castings are about 20 inches in height, 12 inches in diameter and about 1 inch in thickness. The core print pattern for the condenser tube head is made of wood. The design is first laid out and the prints securely fastened in place to the block by means of nails running down through the center. The prints are made of maple and are conical shaped, being about ½ inch in height, $\frac{9}{16}$ of an inch in diameter at the top and about $\frac{15}{16}$ of an inch at the bottom. The core print pattern when finished is then pressed down bottom up into the sand in the bottom flask or mould box, the material being rammed down solidly around the pattern until the flask is evenly filled. A straightedge is then passed over the top to scrape off the surplus sand and the loose material blown off the back of the pattern by the operator by means of a hand bellows. A sprinkling of parting sand or wheat flour is then put over the surface to prevent the sand in the top mould from sticking to the other. The second or top flask is then placed in position and a clay wash put on the sides to make the sand stick. Long wooden gate pins are then placed in position, sticking upright in the sand at the sides and ends of the bottom mould. The top flask is then filled with the moulding sand and carefully rammed down around the pins, which project above the mould.

When the moulding process is completed, the gate pins are withdrawn and a fine vent wire run down through the sand over the surface to the pattern below, to let out the gas and prevent explosion during the casting process. The top mould is then taken off and turned over carefully, with the impression in the sand of the upper side of the pattern. The core print pattern is then taken carefully out of the bottom mould, leaving the impression of the projecting core prints into the sand, into which the operator or moulder places the ends of the bottle-neck cores. These cores are placed in an upright position one at a time until the holes, which number about 1,000, are filled. The cores must be fixed securely and stand up straight and plumb with each other in the holes. This is done by going over each one again and again, the whole operation, including the building up of the mould, taking the operator about two days. A gutter where the gate pin impressions are is cut into the sand, with a number of outlets leading into the mould. The upper flask is then placed carefully in position over the other by means of a derrick and securely bolted, the back of the tube head touching and holding the cores beneath in position. The molten brass is then poured into circular iron head boxes placed around the gate pin holes, the metal running down into the gutters below and into the mould. The metal is poured into the gate holes from the two sides, the molten brass passing between the cores forming, when the mould is filled, the tube holes. The casting, when completed, is allowed to cool for four hours, after which the casting is trimmed of its roughness and filed and sent to a machine shop to be finished for the fitting of the tubes. It requires about 1,800° Fah. to melt the material, which is composed of 1 part spelter, 2 parts tin and 3 parts copper, it taking about 7 hours to melt about 500 pounds with a hard coal fire. The flasks are about 8 feet 4 inches in length, about 4 feet in width, about 7 inches in height and about 1 inch in thickness. The moulds are trimmed up with steel slickers and small particles of loose sand taken out by means of lifters. The sketches were taken from the plant of W. & A. Fletcher Company, Hoboken, N. J.



THE BRASS CASTING INDUSTRY.

PROF. RICHET publishes some figures of mortality from diphtheria in the Revue Scientifique, which seems to show that either the disease has this year taken a milder form or else Dr. Roux's serum treatment is effective. The deaths in 1884 in Paris hospitals were 1,400; from 1887 to 1891 they were from 900 to 960 a year; from 1892 to 1894 they averaged 733; in 1895 they were 239.

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NEW HIGH SERVICE PUMP, BOSTON WATER WORKS.

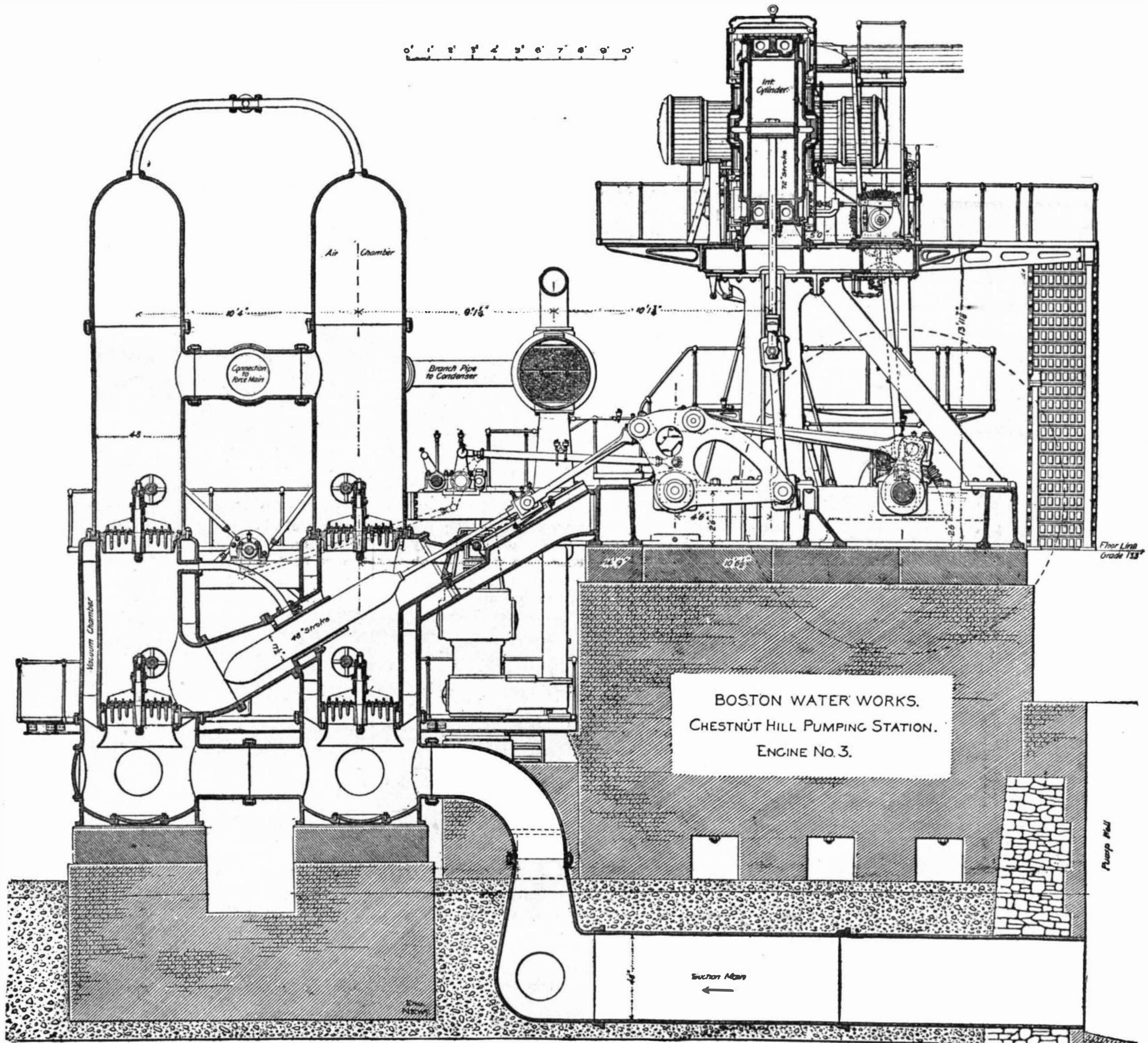
One of the last additions to the water supply system of the city of Boston, Mass., Pumping Engine No. 3, of the Chestnut Hill High Service Pumping Station, is herewith illustrated. In many respects it is novel, and represents, it is believed, an advance on previous practice.

The station is situated on the east side of the carriage road that winds around the base of the Chestnut Hill Reservoir. The reservoir is surrounded by a beautiful park and the building of the station is on the margin of the park between the carriage road and the tracks of the railroad that here run parallel with the drive. The station includes two pumps other than the one we illustrate and a boiler plant. The buildings of the station harmonize with the beautiful surroundings, one of the pleasure grounds of the city.

The great pump is a triple expansion engine of the three-crank rocker type. The cylinders are respectively principle is applied to the steam. The high pressure steam, passing through a separator which dries it, acts upon the high pressure piston. On leaving the cylinder it passes through a tubular reheater, the peculiarity being that the working steam goes outside of the tubes, while live steam from the boiler, at a pressure of 185 pounds to the square inch, passes through the interior of the tubes. The reheaters for the intermediate and low pressure cylinders are identical. The cylinders are steam jacketed, 100 pounds of steam being used for the low pressure cylinder jacket and for the others 185 pounds. The drainage from the high pressure heaters and jackets returns to the boiler, while the drainage from the low pressure jacket and the water separated from the working steam by the separators is automatically drained back into the feed water heater.

The three pump plungers are each of four foot stroke and of 17·5 inches diameter. Their foundation by the connecting rods leading from the main rockers, operate to close each valve positively at the exact moment of the reversal of the stroke. As soon as the valves are closed the mechanism moves out of the way, leaving the valves free to open automatically. This feature makes possible the high velocity.

The dome-like structures seen on the right of the first page view are the air chambers, from which, by a horizontal pipe branching into them, the water is taken for the force main. From these also water is taken to the condenser, which is of surface type, with 410 square feet of surface, the water passing through the tubes and condensing the steam, which circulates about the outside. After passing through the condenser and doing its work, the water is delivered into the force main. The quantity is regulated by a special valve. Directly below the condenser, which is seen in the cut, is placed the air-pump, which, with a 12 inch stroke and 24 inches diameter of cylinder, is worked by



VERTICAL SECTION THROUGH INTERMEDIATE CYLINDER.

HIGH SERVICE PUMP, BOSTON WATER WORKS—SECTIONAL VIEW.

13·7, 24·375 and 39 in. in diameter; the pistons have six feet stroke. The cylinders are carried on platforms supported by diagonal and vertical columns rising from the base plate. The perspective view shows very well the disposition of these columns; the gallery surrounding the cylinders, with its numerous electric lights, is also shown, being one of the really striking features of the installation. Referring now more particularly to the sectional view, it will be seen that the pitmen of the engine act upon rockers somewhat of the bell-crank type. From each rocker two connecting rods run, one to the shaft of the flywheel, this one being nearly approximately horizontal when the crank is at its highest point. The other connecting rod runs in the other direction, at an angle of about 30° from the horizontal, to the plunger rod of the pump proper. Recurring to the steam end of the engine, the steam and exhaust valves are gridiron slides, worked by cams on a horizontal shaft, rotated by gearing from the crank shaft, the gearing being shown on the right of the sectional view. The high pressure cylinder cut-off is regulated by a hydraulic cylinder; the cut-offs of the other cylinders are invariable. The reheating is established below the floor of the engine room. By the reduction of stroke from that of the engine an increased capacity for pressure is obtained, as well as by the relation of diameters.

In the lower right hand corner of the perspective view, two diagonal rods can be seen running upward somewhat similar to the valve rods in a Corliss engine. This is part of a system which forms one of the characteristic features of the engine, the valves being worked by the invention of Prof. Riedler, of the Royal Polytechnic School of Berlin, Germany. The engine has been designed to run easily at sixty revolutions, pumping against a head of 128 feet. This exceedingly high speed is made possible by the use of the Riedler valve gear, here for the first time introduced into this country, although it has been extensively used abroad, in some cases for engines running at a speed of seventy-five revolutions per minute. The pump valves consist of a number of rigidly connected rings, each ring closing an annular opening in the valve seat, as the section shows. The upper valves are delivery valves and the lower are suction valves. The diagonal rods running from the center cam, Corliss engine fashion, and moved an arm from one of the rocker shafts operating the valve gear of the pumps.

The steam plant includes a Belpaire firebox boiler, with two separate furnaces leading into a common combustion chamber. It is shown in one of our views on the strong, specially built truck on which it arrived at the station. The boiler is 34 feet 4 inches long, with a minimum internal diameter of shell of 90 inches. There are 201 three-inch tubes, each 16 feet long. This boiler is for the new pump, being placed in a special addition made at the rear of the boiler house.

Caoutchouc Cement for Cycle Tires.

Bisulphide of carbon, 160 parts; guttapercha, 20 parts; caoutchouc, 40 parts; isinglass, 10 parts. This cement is dropped into the crevices after they have been properly cleaned. If the rent is very big, apply the cement in layers. Bind up the rubber tire lightly with thread, let dry for twenty-four to thirty-six hours, cut off the thread, and remove the protruding cement with a sharp knife, which must previously have been dipped in water.—Zeitschrift.

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Correspondence.

Photographic Decoration of Glass and Porcelain.

To the Editor of the SCIENTIFIC AMERICAN:

I have been much interested in your article taken from the Technical World, re "The Photographic Decoration of Glass and Porcelain," which appears in your issue of August 10, page 90. In the latter part of the article, however, I find that the author has split upon a rock that often falls in the way of novices in photo-ceramics. I need hardly say anything concerning the formula given, as it is so palpably unworkable that we can only suppose it is a printer's error, the amount of solids mentioned being quite insoluble in the quantity of water given. But the chief fallacy to which I beg to call the attention of your readers is one that is bound to fall to the lot of any one attempting to produce a photo-ceramic enamel by the method suggested. The author says, after calling attention to the necessity of coating the powdered image with collodion and then washing out the gum and bichromate, "The film is then dried. and, assuming that the powder employed is of a vitrifiable nature, the tablet is placed in a muffle and heat applied until the fusing point is reached. A porcelain glaze is afterward applied."

Any one attempting to produce a vitrified picture by these means need not be surprised to see the entire film form one or two huge bubbles and then explode. This will be due to the expansion of air present among the particles of powder resting upon the surface of the glaze beneath the film of collodion. The expansion naturally causes the collodion film to swell until it can swell no more, and the fire does the rest. In the production of photo-ceramics by the dusting on process there is one golden rule that must always be observed, and that is to strip the collodion film bearing the powder image and reverse it on to the article to which it is to be fired. In this way we secure the contact of the collodion film upon the final support, and the presence of air is eliminated.

W. ETHELBERT HENRY,
Demonstrator of Photo-Ceramics at the Imperial Institute.
6 Farringdon Avenue, London, E. C.

Small Inventions That Have Brought Fortunes.

No better examples of the importance of small things can be found than among the records at the United States Patent Office, in Washington. There are to be seen certain small objects which, by a lucky turn of affairs or, perhaps, by the ingenuity of the inventors, have become known throughout the United States and even throughout the world, and have been the means of filling the pockets of both the inventors and their representatives. In fact, it would seem as if inventors of small objects have been far better paid than skilled mechanics and engineers who have spent months and years in perfecting elaborate mechanisms. Certainly, in proportion to the amount of work done, the lot of the inventor of small objects is more to be desired than that of the man who spends the best part of his life over an elaborate machine, the merits of which are tardily recognized, not, perhaps, until the inventor, through worry and sickness, is in no condition to enjoy the fruits of his toil. It would seem also as if the inventors of small objects which have paid have not, as a rule, been inventors by profession. They have been for the most part persons who by sheer luck have stumbled upon an idea which somebody else has recognized as a good one. Without the suggestion of this "somebody else," who is usually the one who profits, the great idea, though born, would rarely grow to maturity.

A story current at the Patent Office is told of an old farmer up in Maine. The children of the old fellow, like many other children before and since, had a way of kicking the toes out of their shoes. The farmer was of an ingenious turn of mind, and he cut out a couple of copper strips for each pair of shoes, which were fastened over the toes and between the sole and the upper. The plan proved so successful that the farmer found that, where he had been buying three pairs of shoes, one pair would suffice. There happened along about this time a man from the city with an eye to business. He prevailed on the old man to have the idea patented. This was done, and between $50,000 and $100,000 was made out of it. How much of this the old man got is not known, but it is presumed that the promoter got the larger part. The record at the Patent Office shows only the drawing of the invention as patented on January 5, 1858, by George A. Mitchell, of Turner, Maine.

Another similar invention which made a great deal of money was the metal button fastener for shoes, invented and introduced by Heaton, of Providence, R. I. At the time it was considered a fine invention, for the old sewed button was continually coming off. It has gradually grown in popularity since its introduction in 1869, until now very few shoes with buttons are manufactured without the Heaton appliance.

By a comparatively simple arrangement the shipping tags in use all over the country to-day were made a possibility. The chief trouble with a paper tag was the almost unavoidable tearing out of the tying hole before the package arrived at its destination. A cardboard reinforcement, round in shape, on each side of the tying hole was all that was necessary to make the shipping tag a success. This was the invention of a Mr. Dennison, of Philadelphia, who has made a fortune out of a lucky five minutes of thought.

The chief examiner of the division of toys cites many instances where fortunes have been made on puzzles and similar objects. The pigs in clover puzzle had a curious history. The inventor, Crandall, put it on the market before the patent had been granted, or, in fact, even applied for. Other people, recognizing the value of the invention from a financial point of view, formed companies and began manufacturing the puzzles in even larger quantities than Crandall's company could turn them out. Crandall, of course, contested for his rights and prayed for an injunction. The claim was put into interference, which is a long process and one which tries both the patience of the department and that of the attorneys. The unfortunate part of it for Crandall was that the craze for the puzzle was over before the interference was settled. This is the same Crandall who invented the famous children's building blocks, with dovetailed edges, which had such a run and are popular even to-day.

The return ball, a wooden ball fastened to a thin strip of rubber, with a wooden ring at the other end, which was patented somewhere in the sixties, had a rush of popularity which netted its inventor $60,000, and it is sold widely to-day. The patent has now expired. The flying top, a round tin affair with wings, wound with a string and shot up in the air, made a fortune for its inventor. Several years ago a puzzle appeared which attracted considerable attention. It consisted of two double painter's hooks, which, when fastened together in a certain way, could not be taken apart, except by one who had seen it done. It is said that this invention came about by the merest chance. A painter was standing on his ladder scaffold across the front of a house. He had occasion to use a pair of the hooks, and, picking them up hurriedly, entangled them in such a manner that it was several hours before he could get them apart. He forthwith had drawings made and filed an application for a patent, which was granted. No figures are known at the Patent Office, but it is supposed that he made a large sum of money, for the puzzle was sold for twenty-five cents in all parts of the East, and it cost much less than a cent to manufacture.

A discovery which has been the means of bringing forth a number of inventions, both great and small, was that of Goodyear, the rubber vulcanizer. It was not until the Goodyear discovery of the vulcanization of rubber, in 1844, that rubber could be used, except in a very primitive fashion. Then it was found that, by the use of sulphur at a certain temperature, rubber could be moulded, shaped and worked into any form. Immediately after this discovery, the application clerk at the Patent Office having charge of such matters was besieged by hundreds and hundreds of applications for inventions with the Goodyear discovery as a basis. They related chiefly to matters of form in which it was desired to work rubber. After that time the rubber blanket, the rubber overshoe, the rubber band followed one after the other in rapid succession, and since that time there has not been a month that some patents have not been granted for different forms of rubber.

Now applications are coming in at the rate of four or five a month, involving many applications of the pneumatic tubing or cushioning principle. There are now pneumatic blankets, pneumatic pillows of all descriptions, pneumatic soled shoes for running and jumping and pneumatic car fender guards.

A recent invention which has come into prominence within the last two or three years is the tin cap on the top of beer bottles. This appliance is steadily taking the place of the rubber cork with the iron thumb lever. It is found that the sulphur in the rubber cork is acted upon by the beer, with the result of causing the rubber to deteriorate and spoil the beer. An offer from some whisky makers is attracting the attention of inventors. It is a reward of from $25,000 to $50,000 for an appliance on bottles which will prevent their being refilled. As it is now, all the great whisky and beer manufacturers of the country, and, indeed, of the world, are constantly getting letters from people who complain that they have received inferior qualities of liquids under well-known labels. Of course, it is impossible without some such appliance for manufacturers to guarantee the contents of bottles. All appliances so far with this end in view have been unsatisfactory. The chief difficulty seems to be to make the invention practical and cheap enough for commercial use. The problem has been solved by a number of inventors, but at too great an expense, for it has seemed up to the present impossible to get the cost below $2 a bottle. Completed, the appliance must not cost more than two or three cents a bottle.

Several years ago a patent was granted for an addition to tin cans which made the opening of them a very easy matter, and did away with the old fashioned iron can opener. The can had a small rim just below the top, bent by machinery at an angle just below the breaking point. By a blow on the top of the can around the rim the top would be broken off with a smooth edge. This did not cost the inventor one cent a thousand above the regular price of the cans. Armour, the Chicago meat man, as soon as he heard of the invention, ordered 10,000,000 cans to pack meat in, to fill an order for the German army. The inventor of this can made a fortune in the first six months. His cans are now used all over the United States for oysters and fruits.

The ordinary wood screw, patented August 20, 1846, by T. J. Sloan, is recorded among the simplest inventions that have made the most money. Then screws were cut by machinery, some of which is still used by the American Screw Company, of Providence, R. I.

The man who invented the brass spring fingers one sees on lamps for holding the chimney in place got for a long period a royalty of $50,000 a year. William A. Thrall, a former official of the Chicago and Northwestern Railway, patented, June 1, 1886, a thousand mile ticket which possessed so many advantages that it has been adopted by many Western roads. Several years ago Mr. Thrall resigned his place and is now living on a royalty of $20,000 a year. Within the last two weeks a patent has been granted on a new whistle used principally by bicyclers, and made on the principle of the siren or fog whistle. It is manufactured by a firm in the East, and they have only been able to supply the Eastern trade. The inventor has received for some time past $5,000 a month. Among musical instruments for general use, the autoharp has perhaps made the most money. The first one was patented in 1882. Now they are sold very reasonably, and manufacturers report immense sales every month. The organette, with perforated paper sheets, is another of the money-making musical instruments.—Washington Correspondent to the N. Y. Sun.

The Inventor of the Telephone.

Alexander Graham Bell was born at Edinburgh, Scotland, on March 3, 1847. His father and grandfather were both teachers of languages, and his father, Alexander Melville Bell, long enjoyed a reputation in the field of philology and linguistics, being the deviser of an ingenious system of "visible speech." He intended that his son should follow his profession, and therefore early gave him instruction in the anatomy of the vocal organs, their various functions, and the different subjects belonging generally to the science of vocal physiology.

When quite a child, Bell was told by his father of an automaton speaking machine which he had seen. The boy was so interested that he determined to attempt the construction of such an apparatus himself, and he then and there invented a speaking machine, built it, and made it articulate one or two simple words. In 1865 the family removed from Scotland to London, and about 1866, at Bath, in England, Bell conceived the idea of following up Helmholtz's synthetical experiments in the reproduction of sound, by attempting to transmit speech electrically.

Between the years of 1867 and 1870 he made numerous electrical inventions based on the Helmholtz vowel apparatus, and, before he left England, had resolved to pursue one of these inventions, that of harmonic or multiple telegraphy, to a practical outcome. The idea of actual speech transmission was running in his mind all this time, like an undercurrent of thought that he could hardly formulate in definite expression, but it gradually took clearer shape, and Professor Bell has stated on the witness stand that to friends in England before 1870 he avowed his belief that we should "one day speak by telegraph." In August, 1870, the Bell family emigrated from England to Brantford, Canada, and in April, 1871, Bell went from there to Boston, on the invitation of the Boston school board, to carry on a series of experiments with his father's system of "visible speech," or physiological symbols for the deaf. He remained permanently in the neighborhood of Boston from October 1, 1872, until he removed to Washington in 1881. From the very moment of his arrival in Canada, in 1870, up to the beginning of 1874, his mind was full of the scheme for the multiple transmission of telegraphic messages by means of musical tones, and he had other telegraphic inventions also in hand; but the old idea of speech transmission was persistent in claiming his attention, and gradually his thoughts and energies were narrowed down to this one field of investigation. He has himself narrated more than once the manner in which he proceeded, stage by stage, from his experiments with phonautographic apparatus, human ear drums and apparatus for obtaining undulatory currents, up to the period when he and his assistant, Mr. T. A. Watson, were able to talk to each other telephonically over a short line in the Boston University, and when, by rapid strides, the apparatus was brought to a fair degree of efficiency.—Electrician (U. S.)

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THE EVOLUTION OF THE INTERNATIONAL RACING YACHT.—I.

It was during the fall of the year 1887, and at a time when the ever memorable Volunteer-Thistle contests were in full swing, that the writer had occasion to visit a railroad construction camp that was located high up in the Cascade Mountains of Oregon. It was a remote, a weird and romantic spot, and set amid those surroundings of giant forest, frowning precipice, and snow-clad peak that go to make up the grandeur of Western mountain scenery. It was the last place on earth in which one would look to hear of yachts and international cup racing. Yet here, three thousand miles from Sandy Hook, sat a group of typical Westerners discussing the merits of keel and centerboard boats with an intelligent earnestness that would have done credit to a crowd of Down East fishermen or Sandy Hook pilots. The episode was characteristic of that widespread interest in these contests which is to be found in every corner of the land. Many a sleepy hamlet, whose periods of excitement are strictly limited to the Fourth of July and the annual advent of the itinerant circus, scans its morning paper with a feverish interest on the day of a cup contest, to see whether the mantle of George Steers, the designer of the famous America, has fallen upon worthy shoulders.

The present paper will trace, in a brief way and with the aid of diagrams, the development of the racing yacht in the last ten years, and will show the evolution from American sloop and English cutter of the present accepted type.

In the history of cup contests, these ten years may be called the period of the "single-stickers;" of the sloop versus the cutter; or, as it is more commonly named, the centerboard versus the keel.

Previous to the coming of the Genesta, the two types of yacht, American and English, were radically different. The American sloop, Fig. 6, was a boat of wide beam, shallow draught, and small displacement, with an insignificant amount of ballast, which was often moulded in between the ribs on each side amidships, and known as "wing ballast." She carried a large sail spread, and last, but not least, to prevent her shallow hull from sliding bodily to leeward when on a wind, she had a centerboard.

The peculiarities of her rig, Fig. 4, consisted in great length of mainmast, giving a lofty hoist to the mainsail, the gaff being peaked rather low; a relatively short topmast; a single head sail, which was laced to a boom, the mainsail being also laced to the main boom. Her bowsprit was fixed and had a sharp upward rake from the bow.

The English cutter, Fig. 7, was marked by characteristics directly opposite to those of the sloop. She had narrow beam, deep draught, and large displacement, and carried a perfect "lead mine" of ballast, bolted to the bottom of her keel. Relatively to the American sloop, she had a small sail spread, and her deep keel answered the purposes of a centerboard. Her rig, Fig. 5, was marked by a comparatively short mainmast, the requisite height for light canvas being gained by a lofty topmast. The mainsail had a small hoist, but the long gaff was peaked high, giving a better set to the canvas in windward work. The mainsail was not laced, but was hauled out taut to the end of the boom, the foot of the sail falling with a long, easy curve below the boom. She had double head sails (foresail and jib), and her bowsprit was loose and could be reefed inboard in heavy weather.

Now, here we have two types of yacht that are widely divergent on every point of comparison. To what powerful modifying influence are we to attribute this divergence? The answer is simple. Each type had been developed by the climatic and topographical necessities of the courses on which they were built to sail.

The shoal waters and tortuous channels of American harbors demanded a shallow boat; the light breezes of the American Indian summer encouraged a big sail spread; and a big sail spread on a shallow boat demands a centerboard—and there you have it.

On the other hand, the deep waters of the English harbors encouraged deep draught; the vicious snapping squalls of the English waters prohibited a big sail spread; and the short lumpy seas of the channel called for a hull of moderate beam, with fair and easy lines, as best fitted to split its way through them—hence the cutter.

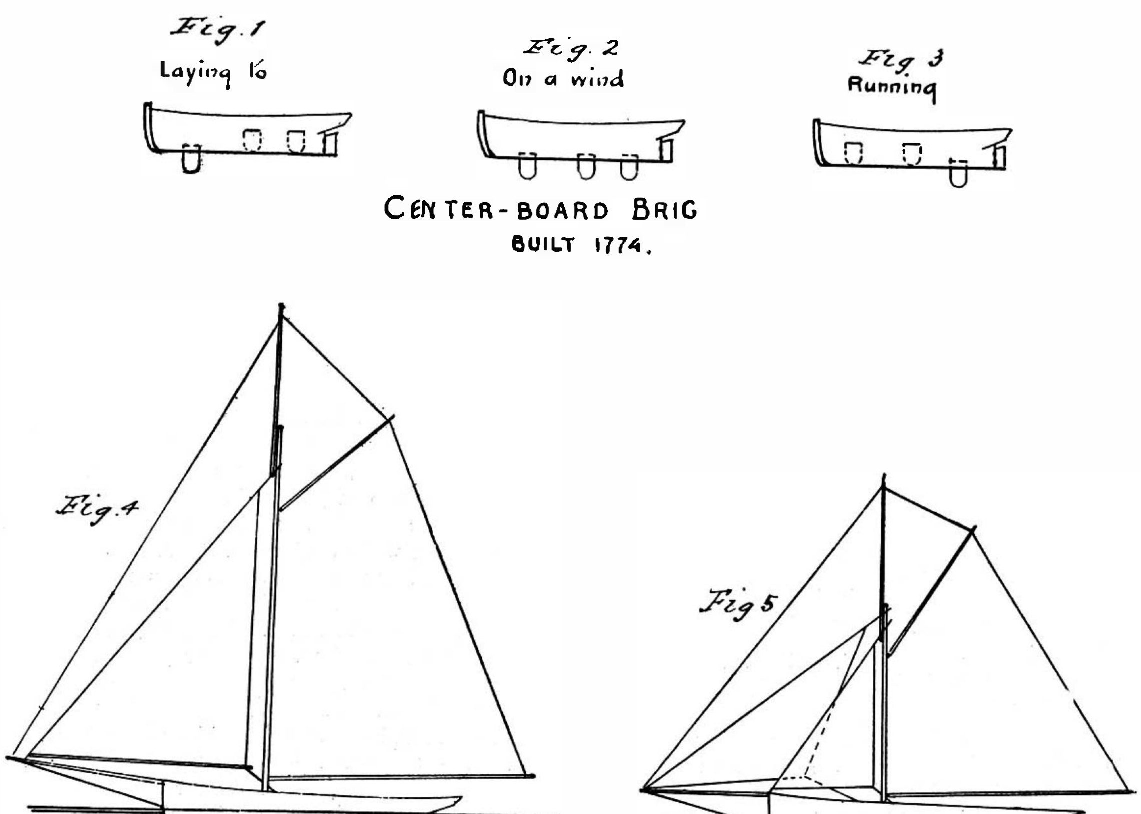
That the centerboard is specially adapted to American rather than British waters is indicated by the fact that more than a century ago it was tried on some English boats and found wanting. In 1774 the English navy built the brig Lady Nelson, of which we present three views, Figs. 1, 2, 3. She was fitted with three sliding keels; and she was tested in a voyage to Australia and back. About the same time a centerboard yacht was built for the commodore of the Cumberland Sailing Society, a Thames yacht club; but the device met with little favor, and we hear no more of it on that side of the water. In this country, on the contrary, it proved to be just the thing. It became so thoroughly identified with the American sloop as to be regarded as its very best feature; and when upon the advent of the Watson keel cutter Madge in 1881, and her victorious career against American centerboards, a school of prophets arose foretelling the speedy decline of the board and adoption of the keel in its place, the controversy waxed warm, and the centerboard advocates contended for the superior excellence of their adopted type with that fervent zeal which only a yachting enthusiast can show.

The keel and the centerboard, however, as we have shown above, are only two among many features that distinguish the two types and that make each peculiarly adapted to its own waters.

The sloop was the product of smooth seas, shallow harbors and light winds, the keel the product of broken water and blustering winds. Each type is ill at ease and an easy victim on the other's sailing courses. Witness the easy defeat of Genesta, Thistle, and Valkyrie in America, and the collapse of Navahoe and Vigilant abroad. Abroad they were "out of harmony with the environment," whereas each type was an easy winner in its own waters.

Now let us leave the centerboard as we found it—an excellent device in its own proper sphere—and by the aid of the figures, Nos. 6 and 7, let us look at the questions of beam and draught in their relation to wind and sea. The center of gravity, G, is a fixed point in the yacht's bulk, and remains the same under all angles of heel. The center of buoyancy, B, represents the center of gravity of the bulk of water displaced by the immersed body of the yacht. Unlike the C. G. of the yacht, it changes as the yacht heels, and keeps moving out to leeward as the fuller body of the boat is pressed down into the water. The action of the dead weight of the boat may be represented by a vertical line passing through the C. G. and pulling down with a force equal to this dead weight; the action of the buoyancy of the water may be represented by a vertical line passing through the C. B. and thrusting upward with a pressure also equal to the dead weight of the boat, or what is the same thing, the dead weight of the displaced water. Now this force, multiplied by the horizontal distance in feet between these two vertical lines (shown by a full black line), will represent in foot tons the righting power of the boat at that particular angle of heel. In the case of the sloop, during the early stages of heeling, and owing to the rapid shifting to leeward of B, this righting power (commonly called stiffness) increases rapidly. As the heeling becomes excessive, the C. G. swings up over the C. B. and the righting lever begins to decrease, as shown in the dotted lines. The sloop will ultimately reach an angle at which G will be vertically over B, when the boat will have lost all righting power, and capsize will follow. So that it is easily seen that the sloop will show great stiffness in moderate winds and dangerously little as a strong breeze lays her down.

In the narrow, deep-bodied cutter, the center of buoyancy, represented by B, moves out to leeward very slowly in the initial heeling, and she will show very slight initial stability. But as the breeze freshens, unlike the sloop, her C.B. keeps shifting indefinitely to leeward and her stability proportionately increasing. Her maximum stability will be seen when she is on her beam ends. This is shown by the thick dotted horizontal line in Fig. 7. The above facts



THE EVOLUTION OF THE INTERNATIONAL RACING YACHT.

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indicate clearly that the beamy sloop can stand up on an even keel under a press of canvas that would overpower her slim and narrow sister. She will have, in this respect, a great advantage in moderate winds. It is true that her great beam will give her bluffer waterlines, and a harder form to drive through the water, as compared with the cutter. But experience has proved that at moderate speeds the difference is slight; and it is only when the beamy boat is driven by strong winds at high speed that wave making sets in. At this point we should expect the fine sharp lines of the cutter to tell in her favor; and experience has shown theory to be correct in this case. In the review of the past ten years' racing, which will be made in the succeeding paper, it will be shown that the lighter the wind the larger was the margin by which the cutter was beaten, and that the only occasions on which she made anything like an even fight were those rare chance when old Neptune was good enough to send the visiting boat a rattling breeze that had something of the English Channel vim and weight to it.

Genesta had one such opportunity in her second race, and Valkyrie in her third race off Sandy Hook. In both cases the advantages of moderate beam, low center of gravity and snug sail spread aloft were clearly proved. J. B. W.

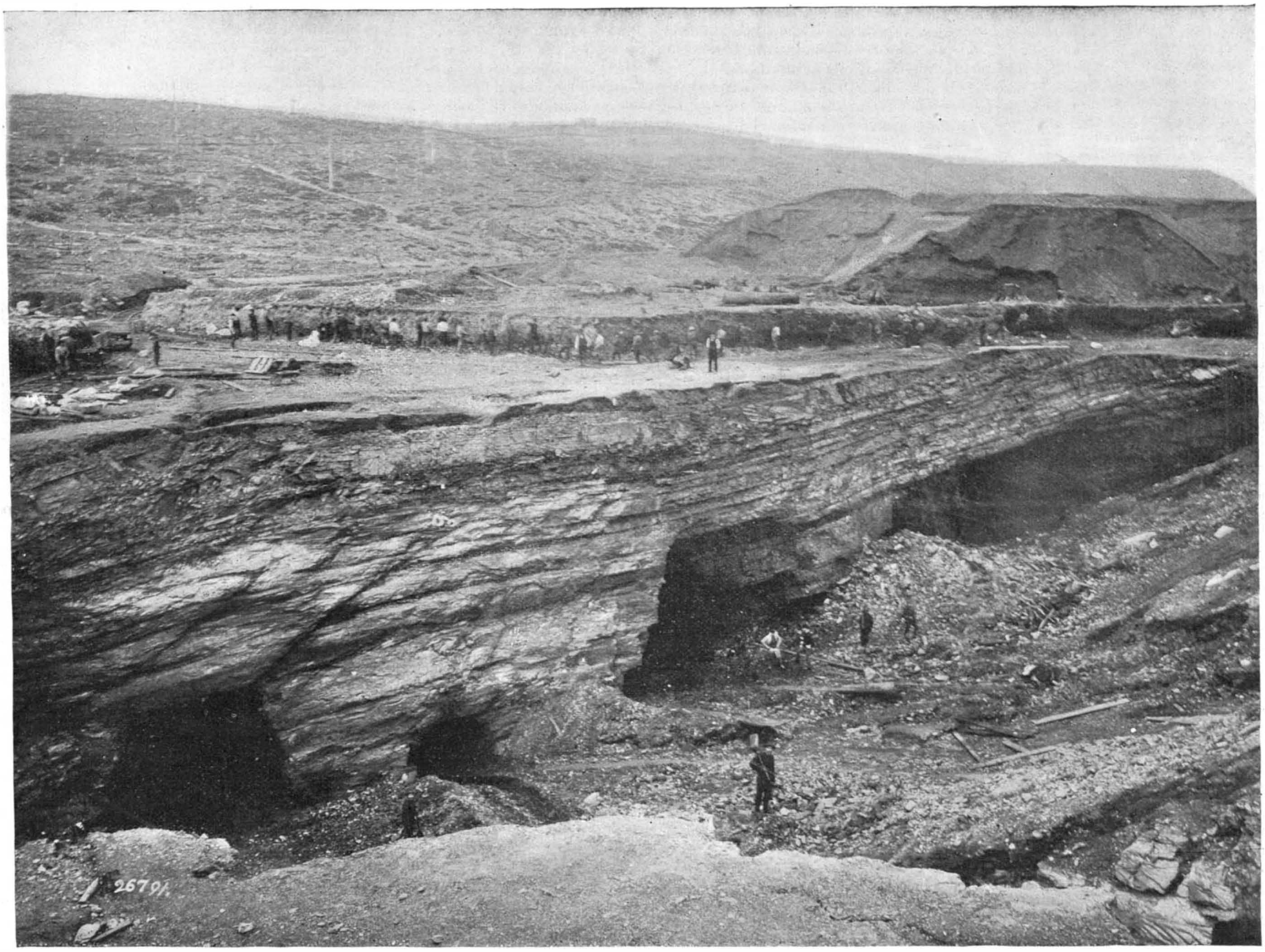
A GREAT COAL VEIN.

Among the largest and most advantageously located coal mining properties in the world are those of the Philadelphia and Reading Coal and Iron Company. In 1894 the company mined 7,415,000 tons, and it receives a large amount annually from royalties on leased collieries. In nearly all the locations where the mines are operated, the coal is obtained in such abundance and with such small expenditure of labor that the operators are extremely wasteful in the work of getting the coal from its place in the earth on to the cars for market, but it is safe to say that there are few places in the world where great quantities of coal are so readily obtainable as on the site shown in our illustration.

At Shenandoah Stupping a thin crust only of land has to be removed when a vein of coal 50 feet thick and of indefinite extent horizontally is reached. The coal is taken to the breakers at the colliery on the other side of the mountain through tunnels at the base of the vein. This stupping has only been worked a short time, but a half million tons have been taken therefrom.

Velvety Lawns.

In the note on "Brown Lawns," in the issue of the Gardeners' Magazine of August 3, it was conclusively shown that the retention of the verdure of a lawn during a period of dry weather depends to a considerable extent upon the supply of plant food in the soil, and that when it is possible to assist the grass with water, the supplies should not be withheld until it has been burnt up. In this note we purpose making a brief reference to the best methods of maintaining or restoring the fertility, as the case may be, of the soil to insure under adverse conditions velvety lawns. To dwell upon the fact that a vigorous growth of grasses cannot be obtained on soils that have become exhausted is not in these pages necessary, but it is essential to direct special attention to the fact that the application of manure to a lawn requires the greatest care to insure its having a beneficial effect. The importance of this will be fully appreciated when it is remembered that the herbage is of a complex character, and includes both gramineous and leguminous plants; and that as these differ materially in their food requirements, the peculiarities of each class must be duly considered. If this is not done, one or other will assuredly predominate. Without entering at length into the scientific aspect of the question, it may be well to point out that certain manures are more favorable to some plants forming the herbage than to others, and that when one kind of manure only is used, the plants for which it is specially adapted will grow with undue vigor and crowd out the others. For instance, dressings of wood ashes and kainit, in consequence of the potash they contain, and of gypsum, by reason of its power of rendering the potash in the soil available as plant food, have a favorable influence pon the growth of the clovers. On the other hand, nitrogenous manures, as nitrate of soda and sulphate of ammonia, promote the growth of grasses, and as a proper balance of grasses and clovers is essential to the formation of a velvety turf, it is important that the requirements of both classes be properly met. It therefore follows that, when artificial fertilizers are used, they should contain phosphates, potash, and nitrogen; superphosphates or bone meal, kainit, and nitrate of soda will give these constituents and in proper proportions if superphosphate and kainit are mixed in the proportion of two to one and applied at the rate of three pounds to the square rod, and subsequently a dressing of nitrate of soda be applied at the rate of one pound to the same area. The mixture may be applied late in the autumn or in February, but the dressing of nitrate should not be given until the end of March or beginning of April. Although these artificials supply the food required by the various plants, they do not supersede stable or farmyard manure, as the latter not only contains all the food constituents necessary, but act as a mulch, and by increasing the humus near the surface materially assist in conserving the moisture about the roots. As usually applied to lawns, natural manures have an objectionable appearance for a considerable period, and we would suggest that instead of spreading the manure over the lawn in a half rotted state, in accordance with the practice which obtains in dressing pastures, it should be dried sufficiently to permit its passage through a sieve and be then mixed with equal quantities of powdery leaf mould and old potting soil. This mixture spread over the turf in the autumn will quickly disappear, and prove of great value in promoting the growth of the grasses and clovers, and preventing the lawn being burnt up during dry weather.



THE MAMMOTH COAL VEIN, SHENANDOAH STUPPING, PA.

A Mine on Fire Over Forty Years.

The commissioners appointed by the local government to inquire into the "history, causes, and effect" of the coal mine fires of Pictou County have just finished taking evidence. The commission is composed of Inspector Gilpin, Deputy Inspector W. Madden, Henry Mitchell, and A. Dick. The work of the commission was directed mainly to an investigation of the condition of the Foord pit. This mine has been on fire in one place or another since the fifties, and it is burning yet. Explosion after explosion has occurred, and many lives have been lost. When fire broke out in one place the miners resorted to another, sinking a new shaft. To avoid the fire on an upper level, a shaft was sunk and coal taken out on the level immediately below the fire. Soon the fire came through, and again the miners were driven out. Nothing that the owners could do availed to drive out the fire, and the splendid mine has been practically abandoned, though a little coal is now being taken out on a level below a part that is on fire. The object of the commission is to learn whether something cannot be done to save so valuable a property as the Foord pit.—Halifax Herald.

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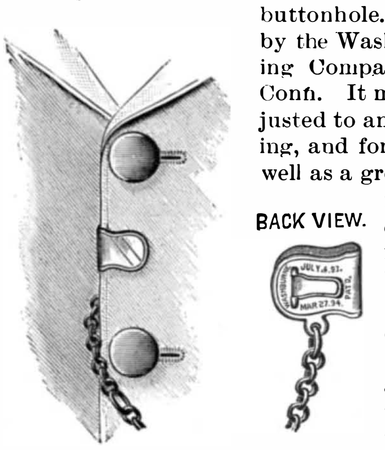
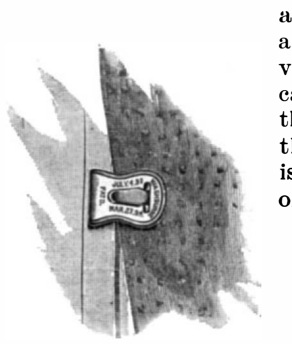
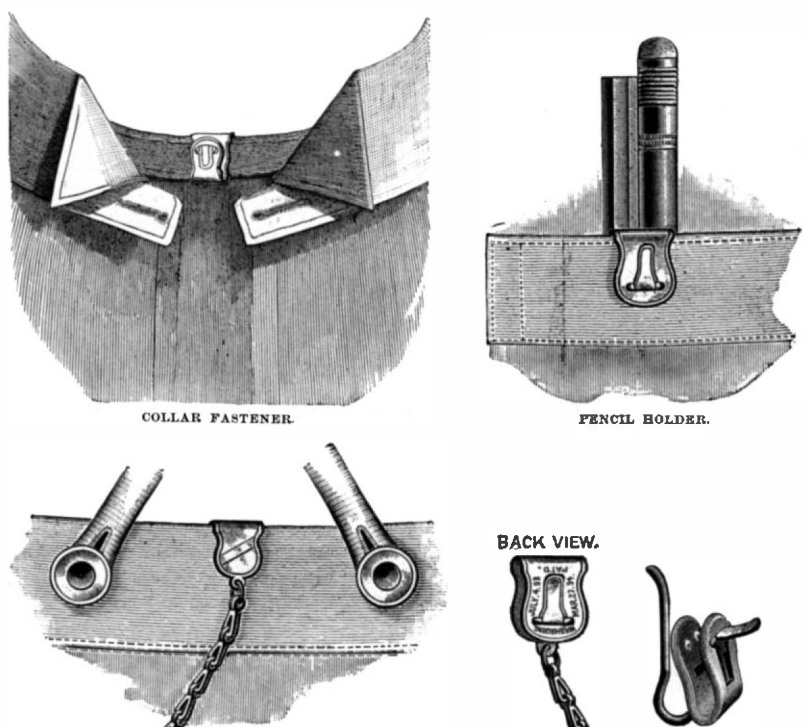
THE WASHBURNE ADJUSTABLE FASTENERS FOR WATCH CHAINS, NECKTIES, COLLARS, ETC.

The accompanying illustrations represent a very pretty and unique little device for the safe and secure fastening of watch chains upon the garments without tearing or fretting the cloth and without using the buttonhole. It is manufactured by the Washburne Manufacturing Company, of Waterbury, Conn. It may be instantly adjusted to any part of the clothing, and forms an ornament as well as a great convenience, being much more quickly brought into service than the buttonhole bar, which frequently causes the buttonhole to gape open, allowing the button to become unbuttoned. The fasteners are finished in 14 k. gold and gold plate, and may be engraved with initial or emblem, thus serving as a society badge in addition to their usefulness. In another application of the device, as a scarf fastener, it presents a very neat appearance, but cannot slip or fall off, although it will not tear or fret the most delicate fabric. It is a simple but practical form of spring clamp made of brass or bronze, and, by lifting the lever in the center of one of its shield-like sides, the edge of the vest or of a pocket, the waistband of the trousers, the edge of a scarf, or of the belt, or any other part of the clothing, may be placed between the open leaves, when an attachment will be securely made by turning down the lever, clamping the fastener into position. In its use as a collar fastener, buttonholes are not required on either the neckband or the collar. A rear leaf of the fastener is first attached by means of the clamp to the proper central position on the neckband, and the ends of the collar are then placed between the open leaves in front, when the closing of the lever securely clamps the collar in place. The device takes the place of the common collar button or stud, and the adjustment is much more easily and quickly made. The free ends of the collar are allowed to lap or pass by each other, so that collars of different lengths may be readily worn over the same neckband. When applied to a pencilholder, it holds the pencil securely, takes up no appreciable room, and presents a neat and attractive appearance, the adjustment being effected by simply opening and closing a lever. As an eyeglass holder its advantages are obvious, from the readiness with which it can be instantaneously adjusted in any desired position upon a garment, and for this service it is largely employed by both ladies and gentlemen.


BACK VIEW.




COLLAR FASTENER. PENCIL HOLDER. KEY CHAIN FASTENER. BACK VIEW. SWIVEL EYE-GLASS HOLDER.

THE WASHBURNE ADJUSTABLE FASTENERS.

Faraday's Disinfecting System.

In 1825 Professor Faraday was consulted by the government about the disinfection of the prison at Millbank. The space amounted to nearly 6,000,000 cubic feet, and the surface of the walls, floors, ceilings, etc., was about 1,200,000 square feet. This surface was principally stone and brick, most of which had been lime-washed. A quantity of salt reduced to powder was mixed with an equal weight of binoxide of manganese, and upon this mixture were poured two parts of sulphuric acid previously diluted with one part of water and cold. The acid and water were mixed in a wooden tub, the water being first put in, and, it being more convenient to measure than to weigh the water and acid, ten measures of water and nine of acid were used; half the acid was first used, and when the mixture had cooled the remainder was added. Into common red earthen pans, each capable of holding about a gallon, were put 3½ pounds of the mixed salt and manganese, and there was then added such a measure of the diluted acid as weighed 4½ pounds; the mixture was well stirred and then left to itself, and all apertures were well stopped. The action did not commence immediately, so there was sufficient time for the operator to go from pan to pan without inconvenience.

On entering a gallery 150 feet in length, a few minutes after the mixture had been made, the general diffusion of chlorine was sufficiently evident; in half an hour it was often almost impossible to enter, and frequently on looking along the gallery the yellow tint of the atmosphere could easily be perceived. Up to the fifth day the color of the chlorine could generally be observed in the building; after the sixth day the pans were removed, though sometimes with difficulty, and the gallery thus fumigated had its windows and doors thrown open. The charge contained in each pan was estimated to yield about 5½ cubic feet of chlorine gas. In fumigating a space of 2,000,000 cubic feet, about 700 pounds of common salt and the same of binoxide of manganese were employed, and it will appear by a slight calculation that about 1,710 cubic feet of chlorine were employed to disinfect this space. In common cases Faraday believed that about one-half to one-fourth of this quantity of chlorine would be sufficient.—The Architect.

Cycle Notes.

Great Britain it is said has 1,300,000 cyclists and a capital of 75,000,000 pounds sterling is invested in the production of these bicycles and tricycles. The factories in which the machines are made give daily employment, so it is reported, to 43,000 men.

The second annual exhibition of cycles and cycle accessories and sundries will be held under the auspices of the National Board of Trade of Cycle Manufacturers at Madison Square Garden, New York City, from January 18 to 25, 1896. Spaces will be allotted October 9, and applications must be received prior to October 4.

A speed indicator called "Howigoe" is being introduced in England. It has no clockwork or springs, but consists of a closed glass cylinder contained in a nickel plated casing which is clamped to the handle bar. At the end of the cylinder is a small pulley wheel which is operated by a cord passing around another pulley wheel attached to the center of the front wheel of the bicycle. When the machine is in motion the glass cylinder is revolved rapidly, the bubble in the liquid with which the cylinder is filled shows the speed which is being made. The casing is graduated from zero up to forty miles an hour. To insure accuracy each machine is graduated separately.

With very little practice on a slight incline any rider may become an expert in back pedaling. Simply reverse the action of pedaling, putting on the pressure gradually and keeping the chain taut, not putting on the weight in sudden jerks.

Very stringent regulations have been adopted for cyclists in Naples. Private machines are taxed $2.40, while those which are rented are taxed $1. Each machine must be numbered and the number must also be on the glass of the lamp, which must be lighted at the same time as the street lamps. A brake and some means of giving warning of approach are also required.

The L. A. W. Bulletin gives the following regarding the packing of pneumatic valves: "Nearly all caps used to stop the openings in air valves have a little washer of some elastic material which is designed to make a tight joint in between the cap and end of metal tube. The most satisfactory material is a partial rawhide such as is used for belt lacing. It may be obtained at hardware stores."

An association to be known as the United States Military Wheelmen has been organized, with offices at 621 Broadway, New York City. The plan is to unite wheelmen who have a knowledge of military tactics into bodies of such size as to test the practicability of moving and maneuvering large bodies of troops with the bicycle.

A correspondent of the L. A. W. Bulletin advises, after numerous experiments, that cotton seed oil in the proportion of 40 per cent to 60 per cent of kerosene produces as nearly perfect a light as is possible.

Booksellers say that the present craze for cycling has nearly demoralized the summer book trade in light literature, for the cyclist does not carry books.

The motor bicycle was used as a pace maker in a race held at Mulhausen, Germany.

Metallic Lactates for Electroplating.

In connection with a paper on the electrolytic deposition, for analytical purposes, of metals dissolved as lactates or glycolates, Dr. Jordis, of Munich, pointed out that lactic acid provides an excellent solvent for electroplating. As yet experiments have only been made in the laboratory with plates of 30 square inches surface. The deposits form so uniformly and easily, however, and adhere so well, that there is great hope for technical processes based upon Dr. Jordis' researches. The expensive free lactic acid is not required. In Germany, according to Engineering, lactic acid is quoted at 590 marks—as many shillings—per 100 kilogrammes (220 pounds); a fairly pure acid can be obtained for 300 marks, while pure lactates of calcium and zinc, from which the acid is generally separated, cost 190 and 435 marks.

Coatings of copper and brass of varying shades on iron, zinc or copper, of zinc on iron and copper, and of iron and of nickel, can be obtained without difficulty, without any special apparatus. Whether the latter point will be confirmed in operations on a larger scale remains, of course, to be seen. As to zinc, Dr. Jordis does not appear to have been particularly successful. In any case, the process has great interest for engravers, whose blocks are not as a rule of large dimensions, and particularly for the silverplating industry. Amalgamated brass is, in a bath of lactate of silver, covered with a pure white coating of silver, which takes the highest polish. It would be a great boon if we could replace the dangerous cyanide of potassium by the harmless lactic acid. The connection with milk might suggest bacteria, as the decomposition of the lactic acid into carbonic acid and acetal aldehyde need not, in the vat, proceed as certainly as it does in platinum dishes. But lactic acid is itself regarded as antiseptic, and the electric current, though perhaps not so fatal to micro-organisms as is often asserted, does not favor their development. The communication was brought before the second annual meeting of the German Electrochemical Society, which assembled at Frankfort-on-the-Main in the first week of June, under the presidency of Professor Ostwald.

Knowlton's Waterproofing for Woven Fabrics.

This composition is used for the purpose of filling up the pores of the fabric previous to the application of the waterproofing material. Two pounds of common flaxseed are steeped in half a gallon of water, until it reaches the consistency of laundry starch. The mixture is strained, and a quart of the liquor is mixed intimately with one-quarter pound of Spanish white. Instead of Spanish white, there may be used ocher, ground chalk, soapstone, or pumice stone.—J. J. K.

Improved Mining and Milling Methods.

A striking contrast between old and new mining and milling methods and conditions is afforded by the old bill in an Arizona mining camp and the report of the operations of the Alaska-Mexican Gold Mining Company for the year 1894. Alaska is more remote than Arizona, yet last year that company worked 73,141 tons of low grade ore at an average cost per ton of $1.97½. This includes everything, and is illustrative of what skill and close management can do in a mine. Of that $1.97½, labor in the mine took less than 70 cents; supplies, 32¼ cents; labor in the mill took less than 24¼ cents; mill supplies, 33 cents; chlorination of concentrates cost 17¾ cents; "general expenses," 7¾ cents; the office expenses, less than 1½ cents; bullion charges, 4 cents. Of course such a result would not be possible, even at the present day, in Arizona; but is worthy of note that in far off Alaska, so remote from supplies of all kinds, a corporation was able to work in one year 73,141 tons ore that only yielded $2.79 per ton and yet make a profit of 81½ cents on each ton. Of the $2.79, $2.11 was free gold, the 68 cents coming from concentrated sulphurets. The year's profits were $59,640; the total receipts, $204,042.

A METHOD of welding lead has been recently devised in France by M. Blondel. The surfaces to be joined are carefully cleaned, and between them is placed a thin layer of lead amalgam. On passing an ordinary soldering iron along the line of junction, the mercury of the amalgam is vaporized, and the lead, set free in an exceedingly finely divided state, fuses and unites the two surfaces together.

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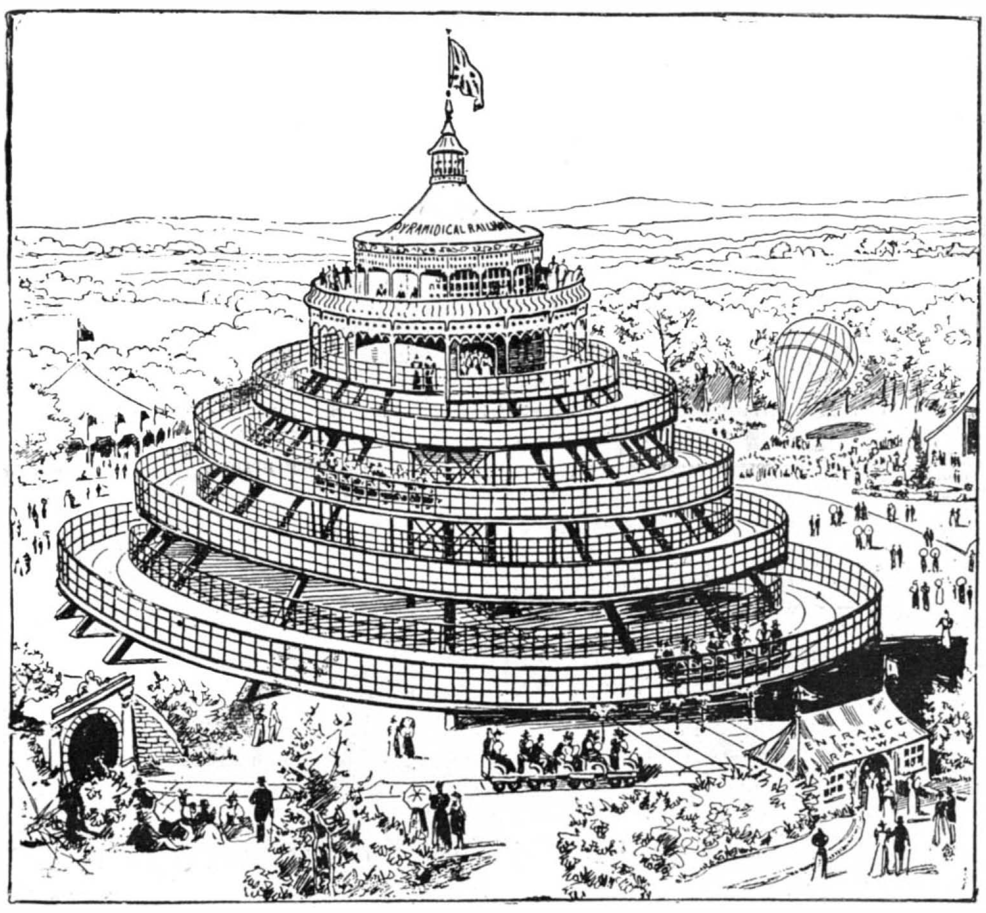
THE PYRAMIDICAL PLEASURE RAILWAY.

A late form of popular entertainment devised for the British public comprises a pyramidical railway, for an illustration and description of which we are indebted to St. James's Budget. It is a recently patented invention, and embraces, as will be seen, many features made popular in our own gravity roads at the seaside and other pleasure resorts. It is a cone-shaped, circular iron structure, or of wood, as the case may be, according to the scale on which it is erected, and from the top downward at an easy gradient is arranged a winding track, round which the passenger in search of excitement may be carried to the bottom as quickly as may be. Perhaps we may describe exactly what happens. The passenger takes his seat in a car on the ground level. The car is then hoisted to the top of the structure by means of a lift, and is run out on to a small turntable, from whence the descent is started. By the time the car reaches the bottom of the gradient it may be imagined that the velocity it has attained is considerable, wherein lies the excitement of the trip. Arrived here, the car runs on to an upward gradient, and passing through a short tunnel—a detail intended to counteract any symptom of giddiness which may occur to persons of weak nerves—comes to a natural stoppage at the point from which it started. It is intended to use the structure as a place of entertainment for many more people than will be able to avail themselves of the cars. For instance, the whole of the track will be utilized as a promenade, a footway being placed alongside the lines, and at the top of the cone will be a covered pavilion, surrounded by balconies, in which may be found a band of music and refreshment bars, while the whole of the inside space beneath the pavilion and within the circular track can be covered in and used as a concert hall or theater. Finally, the power which is used to raise the lifts can be requisitioned to establish a system of electric lighting, so that at night the pyramid may be aglow with a host of small incandescent lamps.



THE PYRAMIDICAL PLEASURE RAILWAY.

What to Wear When Being Photographed.

The sorrows of the trying ordeal, having one's photograph taken, may be mitigated by following a few suggestions made by Mrs. Catharine Weed Ward in the Photogram, the magazine which she and her husband conduct in common. Mrs. Ward says: "The greatest number of sitters are utterly ignorant as to how materials, colors and styles of costumes will appear in the finished portrait, and the operator is blamed for what is, as a rule, not his fault. As a rule it is well—and should be required—to avoid very positive patterns, such as large plaids, checks, wide stripes and much jet or other glittering trimming and much jewelry. Sharp contrasts in materials, trimming or style of cut are a decided detriment to a pleasing portrait, and, as a rule, the tone of color should harmonize with the sitter's complexion and hair. Glistening silks are difficult to light well, as is any material which does not easily lend itself to soft folds. Dead luster silk, soft woolens, crapes, fleecy tissues, and similar materials are always effective." Mrs. Ward advises, too, that one should soften by rendering it indefinite the line between skin and dress, both at neck and wrists, remembering always that, however well a costume may appear in reality, it alters before the camera and may call attention to what might otherwise pass unnoticed.

Practical Golf.*

It is a great mistake to think that the game of golf is confined to country of a special topography, or to well laid out links prepared under the auspices of clubs and experienced golfers from England. Naturally, links which have been laid out by an experienced hand over territory suitable for the game will be better than others, but, practically speaking, any boy or man can make his own links and have many a good game of golf on them, if he has territory enough. If you are at the seashore, for example, you have the very best grounds for links in the sand dunes and the uplands that are usually within a mile of the beach. If you are in the mountains, there is capital country at hand in all the irregularities which are always near mountains. If you are on farm lands, there are sure to be clumps of trees, little ravines, and a dozen other varieties of depressions and elevations, all of which can be utilized. Only one thing is needed in all this, and that is, of course, necessary—a thorough love of the game and a reasonable supply of ingenuity.

Here is the whole principle in a nutshell. The game of golf consists in driving small balls over the country and sending them into a series of holes with mallets or clubs. He who goes the rounds of the holes in the fewest strokes wins. The number of holes or links may be seven, eight, nine, ten, or more. They may be any distance apart. They may be over any kind of country. If there are only four or five, go over these three or four times for one game. If you have eighteen, that is quite enough. Nine is a common number, giving the player eighteen holes in all—that is, nine out and nine back. As it is comparatively easy to "hole" the ball on perfectly level greensward, the scheme is to secure a bit of country which offers obstructions, such as ravines near holes, or stone walls, sand pits, or anything of this nature. In other words, the more irregular the country, to a certain extent, the better the links.

You who are near the seashore should work somewhat as follows, therefore: Go out some day, taking along your American ingenuity, and start from some spot near the hotel. You must select a level bit of earth for a "teeing ground"—a place to start from. Perhaps two hundred yards away there is a deep sand pit. Here is your next spot. Take six inches of four inch gas pipe, and drive it into a level piece of turf or hard ground near the sand pit. Excavate the earth inside the pipe, and there you have a hole six inches deep and four inches in diameter. When the earth around the hole has been thoroughly rolled, you have the first hole and its "putting green." If, in making your stroke from the teeing ground, the ball goes into the sand pit, you have to drive it out by using the clubs, each stroke counting against you. The sand pit or "bunker" is, therefore, what makes the stroke difficult and brings out the skill of the player.

Perhaps three hundred yards on there is a large mound of earth, or a stone wall, or a row of trees. Put the second hole and green just beyond this, and again this obstruction or "hazard" will serve its purpose. The distance may be anything from half a mile to three miles over the links. They themselves may be in a straight line, in irregular lines, or in a circle. It does not matter. Variety and difficulty are the two qualities needed. Of course in thoroughgoing links all teeing grounds should be bits of greensward, perfectly level and smooth, and the course from hole to hole should be free from long grass. But, practically speaking, anything will do.

The game itself consists in hitting this small ball, which is nearly two inches in diameter, with one of the series of clubs from one hole to another over the course. You "tee off" at the start by making a little pile of earth, placing the ball on this with the hands, and thus securing an opportunity for a strong stroke with the club. After this the ball cannot be touched with anything but the club, until it has been holed, except under certain conditions, when it counts against the player. This first stroke is, of course, a long drive, the object being to get as close to the first hole as possible on the first stroke. You may hit a fence, or get into a bunker, or strike a tree. The skill lies in not doing any of these things, but in driving the ball so that it will stop within a few feet of the first hole, if possible on the green. Then your object is to go into the hole on the next stroke, or in the next few strokes.

Having once holed, take the ball out with the hands, make another tee, and drive for the next hole. At the same time that you are playing, your opponent is likewise driving another ball from hole to hole. If you go the rounds of the links in ninety-five strokes, and he does it in ninety-six or ninety-seven, or any larger number, you have won. There are other ways of counting which can be easily learned by one who becomes interested in the game.

Do not make the mistake of thinking that a dozen or more clubs are necessary. They are not, at first, at any rate. By and by, when you join a golf club, and play on well laid out links, with all the refinements possible, some of the extra clubs will perhaps be of use; but for the boy or young man who is beginning, and who does not expect to be a professional or a champion tournament player, six clubs are more than enough. These are briefly:

The Driver is a wooden club of the kind called "bulger." This is used to drive the ball when it is in good position and a long straight distance is to be covered.

The Brassy is a club which is of wood, but has a shoe of iron, hitting thus a more precise and heavier blow. It is to be used for shorter distances and when the ball lies in a position where you cannot get a good, full swing with the driver.

The Cleek is an iron club—that is, the lower part is all iron—and is used for still shorter strokes than a brassy, and where the "lie" or position of the ball is still worse, when a stiff, quick stroke is required, with more precision and less distance to it.

The Mashie has a shorter handle, which is stiffer than the foregoing, and at the same time the face of the shoe is turned backward, so that as you hit the ball it lifts it quickly, differing from the driver stroke just as a "fly" differs from a "liner" in baseball. This club is used for getting a ball out of a sand pit, or a rut in the road, or long grass, where distance is hardly an item.

The Lofter is iron-footed, and still more turned back as to face. It is used to jump the ball out of a deep bunker, and to make it rise quicker while not going so far as the mashie would send it. The lofter is also used to send the ball up on the putting green.

The Putter is a club used for sending very short but extremely accurate strokes, those, for example, which actually send the ball into its hole after it has been sent up on the green with the lofter. Some of these are iron, some wood; the metal are better.

These are all the clubs that are necessary; and with what has already been said of the game and the links, no boy in the country need go without playing golf if he really wants to play. Lay out a set of links and see how easily it can be done.

* By James Hammond, in the Outlook.

Iron in Food.

Professor Bunge, in the course of a paper on iron as a medicine, read before the German Congress of Internal Medicine, has been ventilating some ideas which are as much matter of general science (and therefore extremely important) as they are details connected with the physician's domain. He is strong on the point that iron should reach our blood through the medium of our food, rather than through the druggist's specialties. Iron, as everybody knows, is a food element absolutely essential for the proper constitution of the body. It is as rigidly demanded by the plant as by the animal; and it is from plants that Professor Bunge shows we should chiefly receive our iron supply. Spinach, he tells us, is richer in iron than the yolk of eggs, while the yolk contains more iron than beef. Then succeed apples, lentils, strawberries, white beans peas, potatoes, and wheat, these substances being given in the order in which they stand as regards the plentifulness of their iron constituents. Cow's milk is poor in iron, but, as balancing this deficiency in the food of the young mammal, it is found that the blood of the youthful quadruped contains much more iron than the adult. Thus, in a young rabbit or guinea pig one hour old, four times as much iron was found than occurs in these animals two and a half months old. These are interesting facts, showing that nature probably draws on the original store of iron in the young animal for its nutrition during its milk-fed period.

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Self-motive Carriages and Electric Accumulators.

The foolish race, writes M. Hospitalier in L'Industrie Electrique, that has just taken place between Paris and Bordeaux and back, has brought out incontestably the advantages, henceforward indisputable, of petroleum, or more correctly, of the essence of petroleum or gasoline; it has relegated steam to the second rank and placed electricity much lower still on the list, for a partisan of this mode of locomotion, as bold as rash, presented a carriage which would traverse the 1,775 kilometers of the course, if not in the 100 hours allowed to competitors, at any rate in a time more suited to the future applications reserved for self-motive carriages on public roads.

We need not wonder at the almost entire absence of electricians from this competition, the object of which still remains a mystery to many, and to some a bitter deception.

As regards the bicyclette, the interest attached to the races is, and should only be, ephemeral; practical applications only will survive, and the competitions that present the most practical character are those that will render the greatest service to the development of self-motive locomotions, the dawn of which is appearing at the end of this century. From this point of view, the competition of carriages without horses, instituted last year by the Petit Journal, was much more useful, and responded far better to a real want than the Paris-Bordeaux-Paris race.

But long races from town to town, and long trials of speed over long distances, are not suited to electric carriages deriving their electrical energy from accumulators; these carriages must really be placed on the same footing with carriages drawn by horses which start in the morning and return to the coach house at night, so as to recuperate during the night the energy expended during the day. And, again, these carriages are only suited to applications for conveying people either for purposes of business or pleasure; in a word, we want to realize the electric cab or carriage. For conveying goods, the place is already filled and well filled by the gasoline carriages which are already used by a number of firms for their town deliveries.

A few general figures will suffice to show the superiority of gasoline from a mechanical and economical point of view.

The motors of 2 to 5 horse power used on the gasoline carriages consume about 500 gr. of a density of 0·7 per mechanical horse power hour available on the axle of the motor.

Taking transmissions into account, when considering the efficiency, 1 kg. of gasoline represents at least 250,000 kgm. available at the rim of the wheels. With the boilers used on the steam carriages, 1 kg. of good coal produces at most 6 kg. of steam, and the non-condensing motors consume at least 18 kg. of steam per horse power hour, or 5 kg. of coal per horse power hour. One kg. of coal, therefore, produces at the most 90,000 kgm. on the motive axle and 50,000 kgm. available for traction at the rim of the wheels, taking transmissions into account.

An electric accumulator produces now a maximum of 15 ampere hours at 2 volts, or 30 watt hours, or 18,000 electric kgm., which represents 5,000 kgm. available at the rim of the wheels, taking into account the efficiency of the motor and transmissions. We may assume that the weight of gasoline, steam, and electric motors are to all intents the same, but the petroleum motor necessitates the transport of a certain quantity of water for cooling purposes, and the steam engine that of a still larger quantity of water to be converted into steam on the journey, while with the accumulator we must transport a considerable and constant weight. It follows from this that the figures 250,000, 50,000, and 5,000 do not represent the respective valves of the mechanical energy utilized in the three kinds of self-motive carriages. A closer comparison lowers the comparative value of the steam engine, and raises that of the petroleum engine, since the latter has not to carry uselessly, like the accumulator carriage, a considerable dead weight, the transport of which absorbs the greater part of the available energy.

These figures show that there is no chance of competition between the accumulator carriage and the gasoline carriage in a speed test like the Paris-Bordeaux-Paris race, and they justify the almost entire absence of the former, for only two carriages of the kind were entered, and only one really took part in the competition, arriving at last at Bordeaux after numerous mishaps on the way. But steam has many objections which it would be puerile to mention; petroleum engines have to be started by hand after each little stoppage, they are noisy and productive of much jolting, they exhale an odor which is far from agreeable, and often they can only be persuaded to ascend hills of any steepness on the condition that the passengers are obliging enough to dismount, and sometimes even push the vehicle.

While rendering all due honor to gasoline, and sincerely applauding its success, and notwithstanding the unfavorable figures that we have just quoted, electrical carriages offer such advantages as regards comfort, convenience, simplicity of manipulation, etc., that we must still persist in believing in their superiority for a metropolitan service in large towns provided with distributions of electrical energy. The electric carriage will best solve the problem of the electric cab, the possibility of realizing which we suggested in 1881, and which, it seems, is on the eve of being realized in Paris itself. Qui vivra verra.

Electrocution of Shade Trees.

It is a question whether the stringing of electric wires in cities and villages will not destroy a large proportion of the shade trees. Complaint is made in several cities that where the wires pass through the foliage the trees in nearly every instance have died, presumably from the effects of the electric current. It has been noticed also that the death of the trees almost invariably follows a season of rain, when the wet leaves are good conductors of electricity and carry it from the wires to the trees. In some cases the death of trees has been caused by wires supposed to be thoroughly insulated, the covering having been rubbed off the wires by the friction of the branches when moved by the wind.

The evidence that the trees have been killed by electricity is furnished by the fact that in numberless instances the trees through which the wires pass died in an hour during a storm, while those standing a few feet from the wires were uninjured. These results will raise the question as to the liability of electric light companies for the damage caused by the killing of shade trees. The right to string electric wires does not give the further right to destroy the shade trees, which may constitute the chief value of a piece of real estate. Neither does it give the right to lop off the branches and otherwise disfigure ornamental trees simply because such branches happen to be in the way of the wires. This has been done by an electric light company in one of our suburban villages, and many large and beautiful trees have been practically ruined by such vandalism.

This destruction of trees is quite likely to lead to expensive litigation before a property owner's right to receive damages for his loss is established by the courts. A good deal of trouble could be avoided if electric lighting and power companies would take pains to place their poles and string their wires so as not to interfere with the ornamental trees along their lines.—Chicago Record.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR MOVING BAR.—John McFarland, Austin, Canada. For moving and shifting cars in railway yards, this inventor provides a bar or lever in which fit loosely independent jaws adapted to rest on the rail and grip it on opposite sides, a spring connecting the lever with the shanks of the jaws. When the lever is placed on or over the rail and the handle pressed slightly down, the lever acts in a wedge-like manner on the jaws and causes all the weight to be converted into grip on the rail, the grip being automatically released by the action of the spring when the pressure is removed.

QUICK ACTION BRAKE VALVE.—William Hirst, Trenton, N. J. This invention covers an improvement in triple valves, whereby the pressure in the brake cylinder is retained at all times up to the required full working pressure. It provides a retaining valve in the form of a spring-pressed piston valve arranged in the triple valve exhaust and normally held in open position by pressure from the train pipe, the valve, on reduction of pressure in the train pipe, connecting the triple valve exhaust with a port leading to the main valve to establish communication between the auxiliary reservoir and the brake cylinder.

Electrical.

ELECTRIC TARGET.—Milton T. Weston, Kenton, Ohio. This invention relates to pleasure ground targets to be struck by a spear or wand, or targets for shooting galleries. A circuit closer is actuated from the bull's eye and is so connected as to actuate an alarm, and also, through an electromagnet, release a hanger, whereby a prize will be presented to the one making the bull's eye. The alarm bell and the magnet may be placed above and alongside of the marksman, the bell ringing and the prize dropping by his side on a successful shot being made.

Mechanical.

DOWELING MACHINE.—Christian Loetscher, Dubuque, Iowa. To drive dowel pins into mortised joints in sashes, doors, etc., this inventor has devised a machine in which an inclined spout feed device is grooved to permit the lengthwise shifting of a dowel, a stop plate at the lower end of the spout having an aperture registering with its groove, while a feed tube connected with a plate extends substantially in alignment with the lower end of the groove. The machine has a hollow head in which is a movable plunger, a collar movable relatively to the head being controlled by the plunger, and the head and collar having a dowel feed passage at an angle to the line of motion of the collar.

HAND DRILL.—Robert Binnie, Bolivar, Pa. To facilitate drilling in rock, etc., at any angle, without danger of the drilling tool getting stuck in the hole, the drill shaft is mounted in a carriage on a frame, and on the drill shaft is a sliding frame provided with wheels, cams on the driving shaft engaging the wheels, and there being a worm on the driving shaft and a worm wheel in which the drill shaft slides, the shaft having a key and groove connection with the worm wheel. The drill can be readily set in any desired working position, and is easily moved about from place to place.

Miscellaneous.

WAR SHIP.—George W. Van Hoose, Tuscaloosa, Ala. To enable the whole armament of heavy guns of a ship to be fired at once in any direction, this invention provides a form of turret and barbette in which the turn table of the turret always remains below the upper deck and protected by the barbette, the gun carriage and its housing rising above the deck when firing and falling below it at other times, so that one set of guns adjusted to the higher position may fire directly over another lower set of guns. A special form of barbette, and of turn table with gun carriage and housing, are provided, and special hydraulic devices for raising and lowering the guns and their housings.

WOVEN CHENILLE FABRIC.—Leedham Binns, Philadelphia, Pa. This is an improvement on former patented inventions of the same inventor, providing a fabric having a fine appearance and adapted to be formed in various ways to produce a large variety of styles. It comprises a continuous web on opposite sides of which at intervals are arranged separate sets of warps, wefts being interwoven with the separate sets of warps, while the ends of the wefts project from the outermost warp threads to form tufts.

LOG HAULING DEVICE.—Albert Van Duzer and Walter Kirby, Scotia, Cal. This is a simple attachment which may be conveniently applied to a cable and to a log to be hauled, and adapted to release and permit the logs to slide freely down a steep grade, the attachment being such that the cable cannot get beneath the log, but will always be in position to do the most effective work.

TYPEWRITER COPYING ATTACHMENT.—Charles H. Keith, New York City. According to this invention, a frame applicable to the carriage has a brace to hold it in the position of use and a roller to receive either a duplicating belt of carbon paper extending around the platen roller, or a belt saturated with copying compound, a supply roller to be filled with copying paper, a receiving roller to receive copy paper after the impressions are made on it, and spring-actuated mechanism to turn the receiving roller and cause it to automatically take up the copy paper as it is carried forward by the platen roller in the regular operation of spacing the lines.

ARCHES, PARTITIONS, ETC. — Foster Milliken, New York City. For such constructions this inventor provides a combination of cement and concrete with wrought iron or steel which will develop the full strength of all the materials. The invention consists in corrugating wire or similar material reinforced at its corrugations, bending the corrugated material to shape and bedding the reinforcing material and corrugated material with cement or concrete. The construction is also suitable for roofs, domes, sides of buildings, vault light work, etc.

VEHICLE TOP BOX OR RACK ATTACHMENT.—Lawrence H. Hansen, Viborg, South Dakota. For farm wagons especially this invention provides a means whereby an upper structure may be readily attached to the wagon body, to afford a high body for the carriage of cattle, corn, grain, etc., the sides and ends of the body extension to be dropped down and held at an angle, adapting the vehicle for hauling hay, straw, etc. Locking devices are provided whereby the body extension may be held firmly in whatever position it may be placed, and the upper structure held rigidly in either its expanded or its closed folded position.

GLUE STOCK CUTTER AND FEEDER.—Peter Cooper Hewitt, New York City. By this invention an apparatus is provided by which glue stock may be taken from the washer, conveyed to a cutter and held in position to be acted on by the knives. The cutting machine has a series of circular cutters, a series of serrated disks for holding the stock while it is being cut, a glue stock conveyor consisting of endless belts extending between the disks, guards between the cutters preventing the stock from being carried around by them. Adjustable gearing connects the shafts of the cutters and disks for regulating the position of the cutters relative to the disks.

BOX LID RAISER AND FASTENER.—Charles L. Feinberg, Brooklyn, N. Y. According to this invention, a catch is fixed to the body of the lid and a keeper to the adjacent portion of the box body, there being combined with the keeper a spring capable of raising the lid on the disengagement of the catch and keeper. That portion of the body which carries the keeper is yielding, so that it may be moved to engage or disengage the catch and keeper, the automatic raising of the lid being simultaneously effected with the release of the fastening device.

CURTAIN FIXTURE.—Delbert B. McCapes and Edward D. Quinn, Vermillion, South Dakota. This is designed to be a handsome attachment to be applied to the outer or inner face of the window frame to hang an ordinary window shade roller in, so that it may be readily adjusted vertically to bring the roller to the desired height. It comprises a slotted barrel in which slides a bracket projecting through the slot, means for fastening the barrel to a support, and an adjusting rod extending upward into the barrel and connected with the bracket.

CAPSULE FILLER.—Albert M. Ingalls, Duluth, Minn. This improvement comprises a funnel having at its outlet end an expansible and contractible tube to receive and hold by contraction a capsule body while being filled, and a double-ended reversible rammer with a longitudinal bore serving as an air vent. It is easily operated and simple in construction, and facilitates the rapid filling of capsules with the desired amount of medicinal and other material.

DENTAL MATRIX.—Joseph M. Strout, Portland, Me. A matrix retainer, comprised in this invention, can be set up by the fingers in like manner as a wrench, and placed in position as a napkin holder and cheek distender, or it may be turned down close to the gum, being quickly adjustable on either the upper or lower teeth or the bucal, lingual or palatine surfaces and crosswise of the teeth. The matrix is inexpensive and is made in sections united at one point in their length in a manner to be readily disengaged when withdrawn, obtaining the result of a band matrix, yet possessing the advantages of a two-piece matrix.

GAME COUNTER.—William F. Hochspeier, Jersey City, N. J. This device comprises a board on which are parallel rows of figures, one row having its figures in groups or series and the other having figures to correspond to those in the groups of the opposite row, there being tilting angular finger pieces pivoted between the rows. It is intended for use in games where successive amounts are made to complete a final total.

GAME COUNTER. — Joseph Voelker, Pittsburg, Pa. This device has a shallow cylindrical case whose cap piece has a single orifice, an inverted concave bell being held within the case and a dial rotating on the post, while a series of indicators is adapted to successively appear at the orifice in the cap piece, being moved with a step by step movement by actuating mechanism within the bell, as the player presses upon a finger piece projecting from one side of the case.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE MINERAL INDUSTRY, ITS STATISTICS, TECHNOLOGY AND TRADE IN THE UNITED STATES AND OTHER COUNTRIES TO THE END OF 1894. Vol. III. Edited by Richard P. Rothwell. New York: The Scientific Publishing Company. 1895. Pp. 770. 8vo. Plates, illustrations and tables. Price $5.

To the engineer, the chemist, the metallurgist, the buyer, the seller of minerals, the investor in mineral property, and to the legislator who should know the resources and conditions of production in every country, this work is absolutely indispensable. This is the third volume of "The Mineral Industry," and brings the subject up to date. The work describes the occurrence and character of deposits in which the useful minerals are found, the characteristics of the mineral, the methods of mining, treatment of ores, characteristics of metals, costs, uses, statistics of production, import and export, consumption, review of mineral, metal and mining stock markets, assessments by mining companies and dividends from 1884 to 1894. To this are added extremely valuable technical articles by the most competent authorities, giving the most recent progress in each department of mining, metallurgy, and chemical industry, thus bringing the technical literature up to date. The tables of itemized cost production of many of the minerals and metals afford information of the utmost value to all interested in the in-

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dustry. Vol. III contains the table of contents of the two preceding volumes, so that the literature on such subjects as carborundum and monazite can readily be traced. A splendid index contains about 12,000 separate titles.

AN ELEMENTARY TEXT BOOK ON STEAM ENGINES AND BOILERS FOR THE USE OF STUDENTS IN SCHOOLS AND COLLEGES. By J. H. Kinealy. New York: Spon & Chamberlain. 1895. Pp. 236, 8vo, 103 illustrations. Price $2.

The author is Professor of Mechanical Engineering in Washington University, St. Louis, Mo. He states that the book was written more especially for students in the universities and colleges. The student is first given an idea of thermo-dynamics, then of the action of steam in the cylinder of the engine, of the motion of the valve, of the differences between the various types of engines and boilers, of the generation of heat by combustion, and of the conversion of water into steam. In the derivation of some of the formulæ in thermo-dynamics the calculus is used, but the use of all mathematics higher than algebra and geometry has been avoided as much as possible. The subject is presented in a clear and concise manner.

MONOGRAPH ON FLUID EXTRACTS, SOLID EXTRACTS, AND OLEORESINS. By Joseph Harrop, Ph.G. Columbus, Ohio: Harrop & Company. 1895. Pp. 230. 16mo. interleaved. Price $2.

By the author of the well known "Monograph on Flavoring Extracts." The druggist of to-day is fitted by reason of the good education which is now required by registered pharmacists, and handy appliances, to manufacture many of the preparations which once were the sole product of large establishments. The work treats of the articles used in the manufacture of medicinal extracts, the processes of manufacture and preservation. There are formulas for fluid extracts, solid extracts and oleoresins. The work should find a place in the working library of all pharmacists who make their own fluid extracts.

CINEMATICA DELLA BIELLA PIANO. Studio differenziale di cinematica del piano con applicazioni alla costruzione razionale delle guide del movimento circolare e rettilineo. Per L'Ing. Lorenzo Allievi. Naples: Francesco Giannini & Figli. 1895. 8vo. 2 vols. Pp. 151. 29 plates.

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SEPTEMBER, 1895.—(No. 119.)

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2. A residence in the Colonial style, recently erected in Tennis Court, Flatbush, L. I., at a cost of $7,500 complete. Perspective elevation and floor plans, also an interior view. Messrs. Stevenson & Greene, architects, New York City. An attractive design.
3. A dwelling at Bronxwood Park, N. Y., recently erected at a cost of $6,000 complete. Two perspective elevations and floor plans. Mr. J. M. Lawrence, architect, Mt. Vernon, N. Y.
4. A residence at Mt. Vernon, N. Y., recently erected at a cost of $8,000 complete. Perspective elevation and floor plans. Mr. Walter F. Stickles, architect, Mt. Vernon, N. Y. An attractive design in the Colonial style.
5. A cottage at Bergen Point, N. J., recently erected at a cost of $4,200. Mr. Wesley J. Havell, architect, New York City. Perspective elevation and floor plans. A neat design, showing some original and pleasing features.
6. A dwelling at Bedford Park, New York City. Two perspective elevations and floor plans. Mr. Edgar K. Bourne, architect, New York City. An attractive design in the English Gothic style.
7. A two-family dwelling recently erected at New Haven, Conn. Two perspective elevations and floor plans. Cost complete, $5,080. Architects, Messrs. Stillson & Brown, New Haven, Conn.
8. St. Ann's Episcopal Church, Kennebunkport, Me. Perspective view and ground plans, also an interior view. Mr. H. P. Clark, architect, Boston.
9. A residence at Williamsport, Pa., recently erected for J. F. Fredericks. Architect, David K. Dean. Perspective elevation and floor plans. An attractive design.
10. A Colonial house at Far Rockaway, N. Y. Architects, Messrs. Child & De Goll. Perspective elevation and floor plans. A model design.
11. Miscellaneous contents: The Hayes metallic lathing, illustrated.—Neolith as a paint and decorative medium for relief work, illustrated.—Gas radiators, fire grates, etc., illustrated.—Improved heaters, illustrated.—Improved sash lock, illustrated.—American homes and the cabinet or parlor organ, illustrated.—The Laurie steel lath, illustrated.—The Austin & Eddy sash hanging attachment, illustrated.

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(6613) S. D. writes: On perusing your paper of March 9, 1895, page 150, I read a paragraph headed: "Wire Fence Telephones in Australia," and thought you would be interested to learn that about seven months ago I utilized the top wire of the existing fences for telephonic use and it works to satisfaction. The line is about two miles in length, the wire being with staples as usual, no insulation is needed. At the splices we scrape off the rust and make a continuous connection.

(6614) J. L. says: What is meant by the aromatic group in chemistry? A. A class of hydrocarbons, chiefly characterized by containing a group of six carbon atoms in which, out of the twenty-four units of atomicity, eighteen are supposed to be saturated by union of carbon with carbon, leaving only six open to external saturation.

(6615) J. M. B. asks: How can the globes on incandescent lamps be colored red, blue, green, and opal? I want a coloring that will not wash off, and that will not flake off by the heat. A. 1. Prepare the glass by thoroughly washing in soap and water and drying. Then dip in bath, made by beating up the whites of two eggs in 1½ pounds or pint of water and filtering, and hang up to dry. Dissolve the aniline color in photographer's common collodion. 2. Red or blue aniline will form clear solutions, while the green solution will require filtering. 3. Yellow aniline forms a handsome color, but the surface of the glass presents a frosted appearance after the application. 4. Violet and purple colors may be obtained by combining red and blue in different quantities. When the solution is ready, dip the prepared glass bulbs therein, hang up to dry, and finally pass a current through the bulb for half an hour, that the heat thus generated may harden the coating of the collodion, or place in a current of air. 5. The preparation can easily be removed with alcohol or sulphuric ether, but is not affected by water. Experience has shown that the best results are obtained by not using too much aniline. Make the color light rather than deep, and apply two or three coats.

(6616) W. S. says: A cannon ball is fired from a cannon in a horizontal position, another cannon ball is dropped from the mouth of same cannon at the moment of firing. Which will strike the earth first? A. The effect of gravity on a falling body is the same whether moving with high velocity horizontally or dropping vertically, but as a cannon ball fired horizontally at the cannon points in a tangent to the earth's surface, the dropping ball will reach the earth first by a very small fraction of time.

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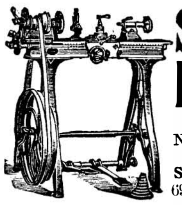

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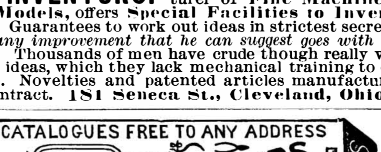

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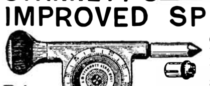

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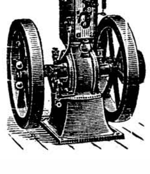

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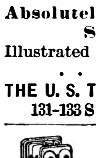

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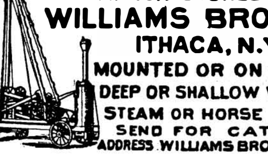

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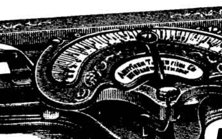

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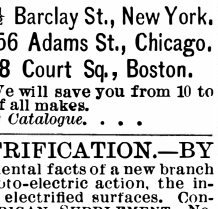

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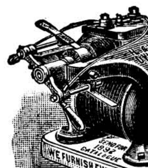

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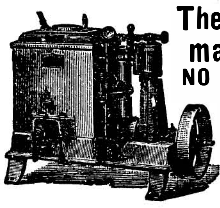

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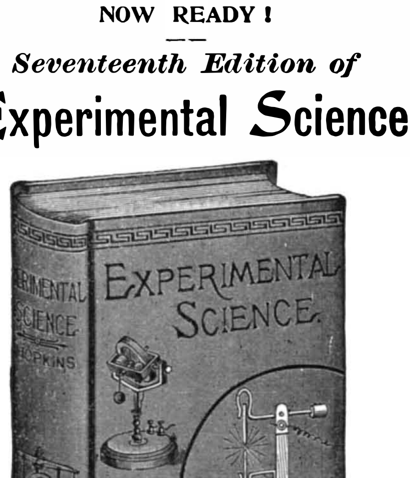

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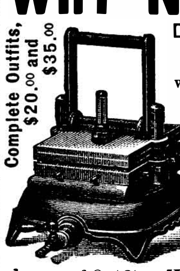

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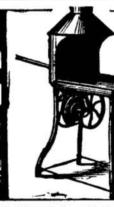

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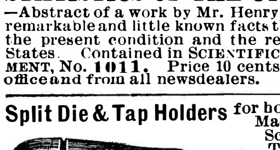

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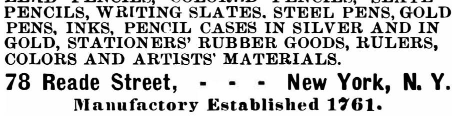

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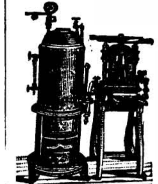

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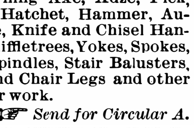

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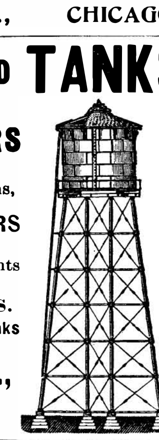

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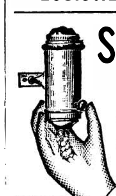

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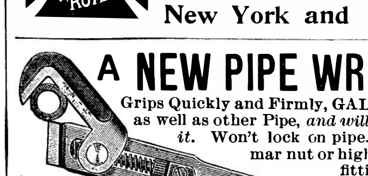

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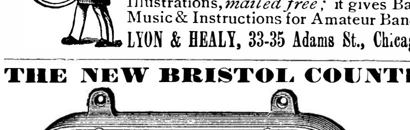

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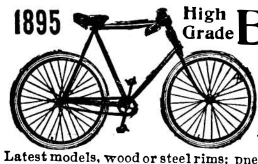

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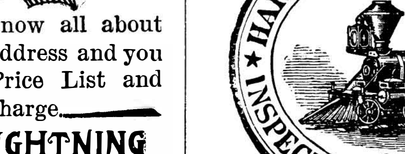

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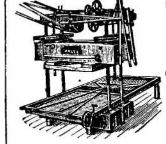

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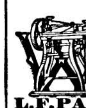

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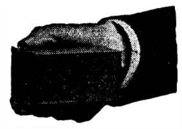

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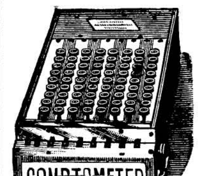

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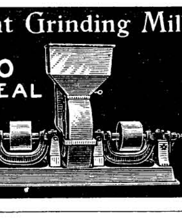

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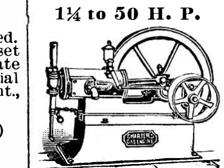

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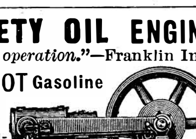

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